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Manufacturing the Miehle Printing Press

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Some unusual methods — Special machines and their operation — Turning printing press cylinders — Interesting grinding work Inspection methods and tools—The first of two articles

THE MODERN printing press is a ponderous, yet beautiful piece of work; massive rolls in a huge frame, applying ink with a delicate, even pressure to sheets of paper that are manipulated by the most intricate mechanism. The building of such presses includes some interesting operations, as is evidenced by the following descriptions of methods in use at the plant of the Miehle Printing Press and Manufacturing Company, Chicago, Ill.

The operation of turning cast-iron impression cylinders is shown in Fig. 1. The cylinders run as large as 30 in. in diameter and 6 ft. long. The machine in use here is an I. H. Johnson, Jr., 54-in. lathe, with a tool rest designed especially for this job. The tools are of ½x1½-in. high-speed steel and the apertures in the tool holder are arranged so that each tool takes a cut to the left of the tool that precedes it. Thus the five tools take a cut approximately ⅛ in. wide, all tools cutting at the same depth, which is approximately ¾ in. After this roughing cut is completed, a finishing cut is taken with a tool ½ in. wide and the roll is laid aside to season. Experience has taught that a cast-iron cylinder of this size will season—that is, the strains in the metal will be released—in from two to four weeks, after which the finishing cut is taken. The cylinder is finish-turned on its own journals, using a single tool ½ in. wide. The 48-in. lathe that is used for the finish turning is never used for anything else, in order that it may be kept in first-class condition.

The operator shown in Fig. 2 is gaging a cylinder after the finishing cut is done. The matter of parallel is the most important item, the limit of a cylinder of this size being 0.001 in. The cylinders are of a number of different sizes and a gage is supplied for each size. These are tried at regular intervals on the master gages shown in Fig. 3, and at the least indication of wear, they are taken to the tool room and adjusted.

A Portable Shaper

Each cylinder has a cored opening in the side, which has to be finished on all sides. The operation is done on a planer, but before the cylinder goes to the planer, the slot is enlarged to accommodate the planer tool. This is done by means of the portable shaper shown clamped in position in Fig. 4. The tool, which cuts on the downward stroke, can be seen reversed just above the opening in the cylinder. The illustration, Fig. 5, shows a side view of the shaper, giving a clearer idea of the

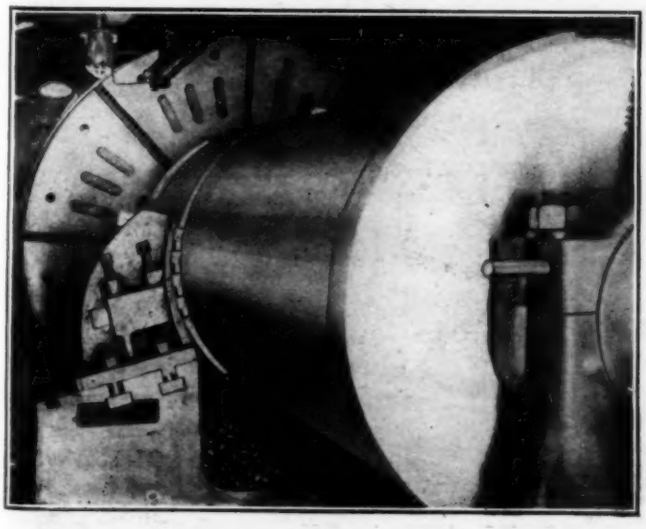


FIG. 1—TURNING PRINTING PRESS CYLINDERS

FIG. 2—GAGING THE CYLINDERS

FIG. 3—MASTER DISK GAGES

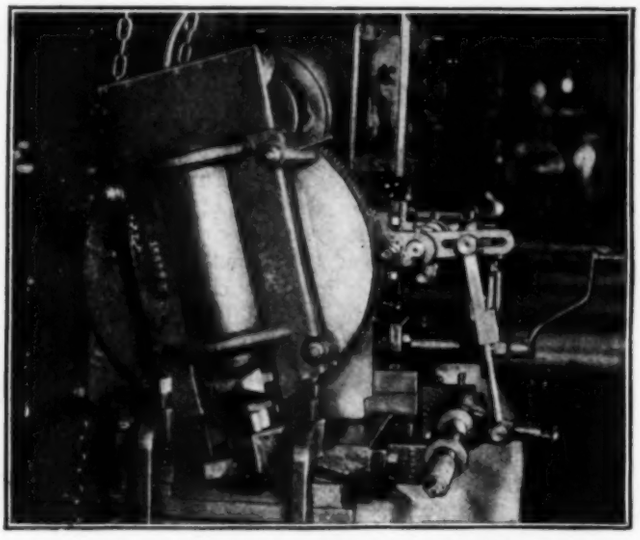


FIG. 4—PORTABLE SHAPER IN POSITION

manner in which it operates. A 1½-hp. Crocker-Wheeler motor drives a pinion and gear, which in turn operate the crank in the same way that the crank on a slotter is operated. The upper part of the machine can be fed across the cylinder by means of the crank in the immediate foreground. A study of the photograph will reveal both automatic cross and lateral feeding mechanisms.

The illustration, Fig. 6, shows a portable or trolley drilling and tapping machine in position for tapping one of the seventeen holes in each side of the opening. As the carriage on which the roll rests runs on a track that is square with the I-beam from which the machine is suspended, when the cylinder is in position for drilling one hole, it is only necessary to move the drill along the I-beam to perform the rest of the operations. The handwheel *A* controls one of the rollers on which the cylinder rests, so that the cylinder can be turned as desired. The handwheel *B* controls the gearing by which the carriage is raised and lowered, and the handwheel *C* controls the gears that turn the wheels on which the truck is mounted. These are flanged wheels running on a track in the floor.

The ink rollers used on the large types of machines are made of sections of steel tubing, closed at the ends

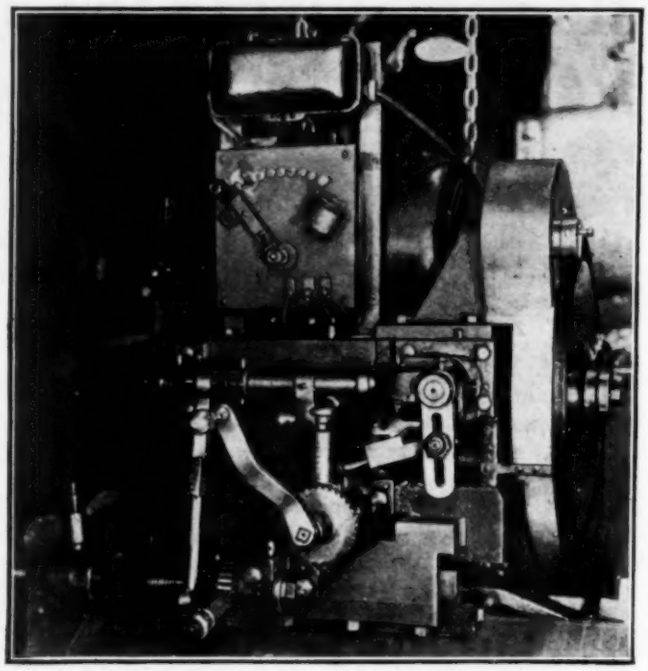


FIG. 5—SIDE VIEW OF PORTABLE SHAPER

to form journals. A number of tubes are placed with one end of each in a furnace, where they are heated to a welding heat, then the hot ends are closed by forging, using a Bradley hammer as shown in Fig. 7. The dies are shaped to taper and close the end of the tube, and when an end is partly closed, a short piece of ⅝-in. steel rod, heated to welding heat, is inserted into the opening

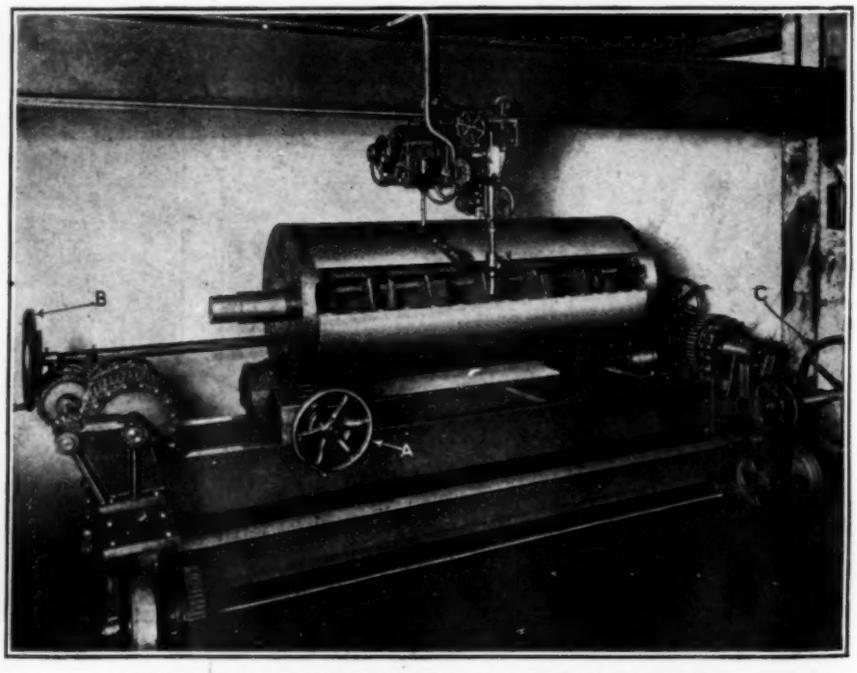


FIG. 6—TROLLEY DRILLING AND TAPPING MACHINE

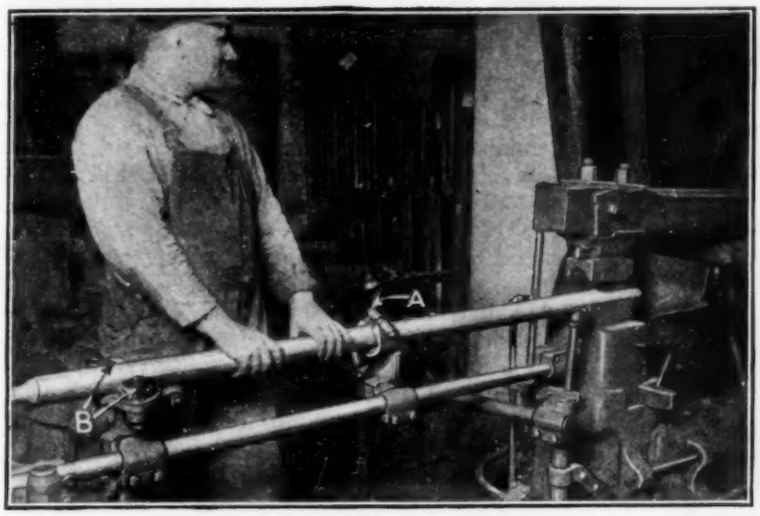


FIG. 7—CLOSING END OF STEEL TUBE

and the end is closed around it. This makes a solid end and of the necessary strength. A ring *A* is clamped around the center of the piece and held against a rest by the operator as shown, so that the blows will all come at the same distance from the end and the result will be a smooth, even job. Due to the taper in the die, the tendency is for the tube to "kick back" away from the machine when the blow is struck. This is prevented by

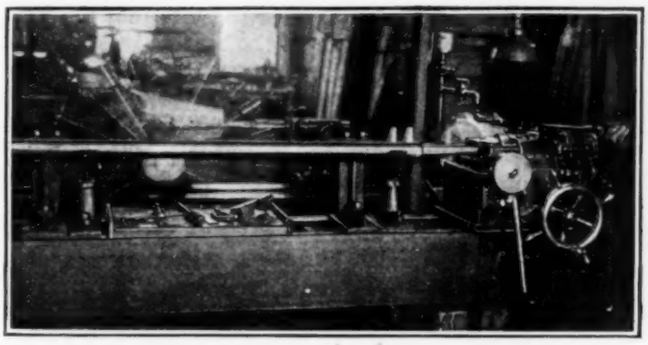


FIG. 8—MILLING AND CENTERING ROLLERS

steel disks in the hinged piece shown at *B*, the pieces being held against the tube by springs. This mechanism allows the tube to be drawn toward the machine, but any movement in the opposite direction pulls the edges of the disks into the tube and it is prevented from further movement away from the machine.

The ends of the ink rollers are milled off and centered in the machine shown in Fig. 8, both operations being performed before the piece is removed from the machine. The head which carries the tools is fed cross-wise by means of the handwheel *A*, Fig. 9, and the centering tool is operated by means of the handle *B*. After the end of the piece has been milled off, the head is fed to a stop, at which point the centering tool is in the correct location for centering the piece. Two jaws that hold the work are operated by the wheel and handle shown at the left of the photograph.

The illustration, Fig. 10, shows a tape roller being ground on a Norton grinding machine. These rollers vary in size, the largest being 4 in. in diameter and 7 ft. long. A maximum of 0.001 in. is the allowance both as to diameter and taper between ends. The ink fountain roller, however, must be even more perfect, so the end bearings on this roller are ground with the roller on centers. Then the roller is put into a machine that is so arranged that the roller is held on its own bearings, as shown in Fig. 11, and the rest of the roller is ground. The roller is revolved by means of two small pins in the faceplate of the machine, which engage a dog on the end of the roller. A fluid gage is used to test the roller before it is taken out of the machine, and although a limit of 0.0001 in. is allowed, the gage usually shows the roller to be perfectly round, no variation in the height of the fluid being visible.

Another grinding job is shown in Fig. 12. Here a number of slider rollers are being ground in a Norton machine and will be tested for accuracy of diameter by means of the "Go and No-Go" block gages shown standing on the table. The difference between the blocks is only 0.00025 in. and every roller

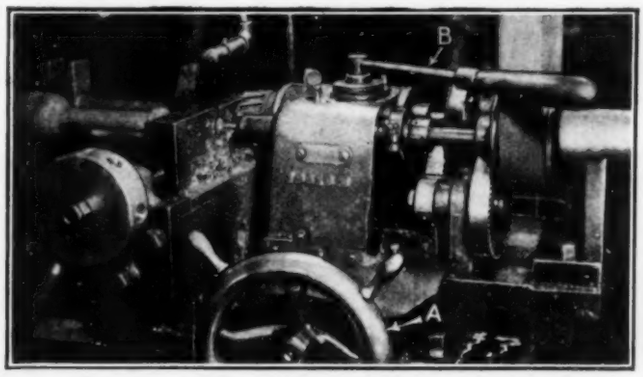


FIG. 9—HOW THE TOOLS WORK

has to stand this inspection. These rollers carry the weight of the type bed, consequently they must be all of the same size. Quality is the feature of this job.

The job shown in Fig. 13 is that of grinding the hole in a governor cam, using an Onsrud pneumatic turbine grinder. The air which drives the grinder is supplied through the air hose shown at the right of the photograph. No gears or belts are used in the construction of the grinder, the air driving a series of turbine blades

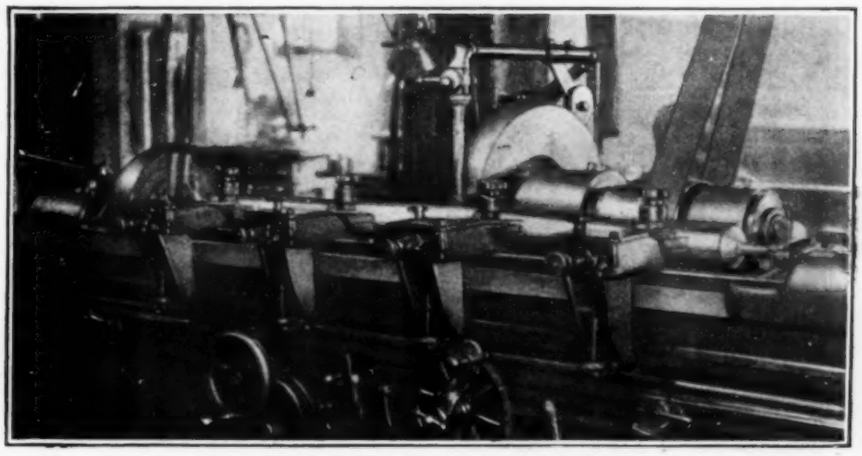


FIG. 10—GRINDING AN INK ROLLER

that can be controlled at any speed up to 30,000 r.p.m. The hole in the governor cam is 2⅞ in. in diameter and 3 in. long, and the production is approximately two pieces per hour. The hole is held to a limit of ± 0.0005 inch.

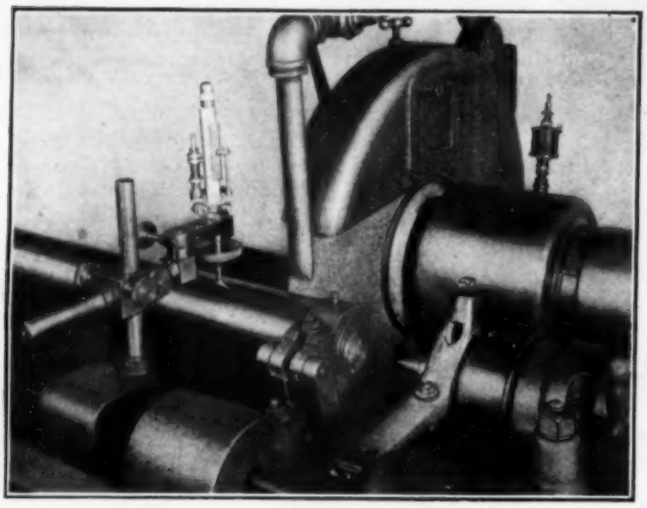


FIG. 11—USING THE FLUID GAGE

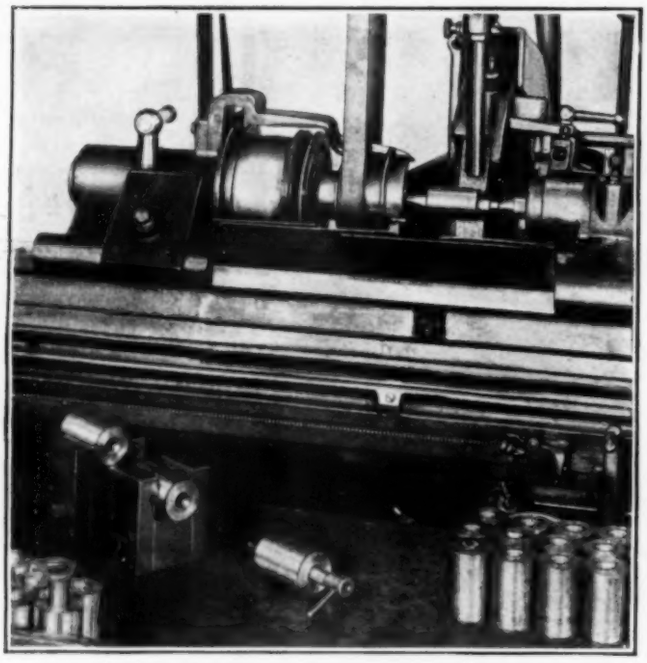


FIG. 12—GRINDING AND GAGING SLIDER ROLLERS

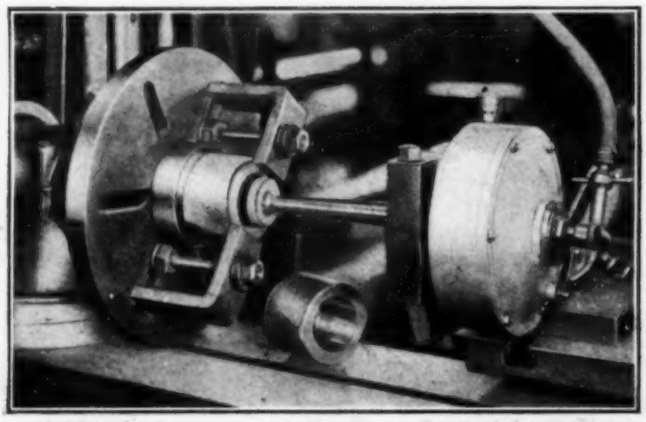


FIG. 13—USING A PNEUMATIC GRINDING ATTACHMENT

Winning Confidence Abroad by Demonstrating

A unique method of selling machinery in foreign markets has recently been brought to the attention of Trade Commissioner Perry J. Stevenson of the Bureau of Foreign and Domestic Commerce, stationed at Johannesburg, South Africa, and, as it has evident advantages, it may be of interest to American manufacturers of industrial equipment who have agencies in foreign markets or are contemplating the opening of such agencies to distribute their products.

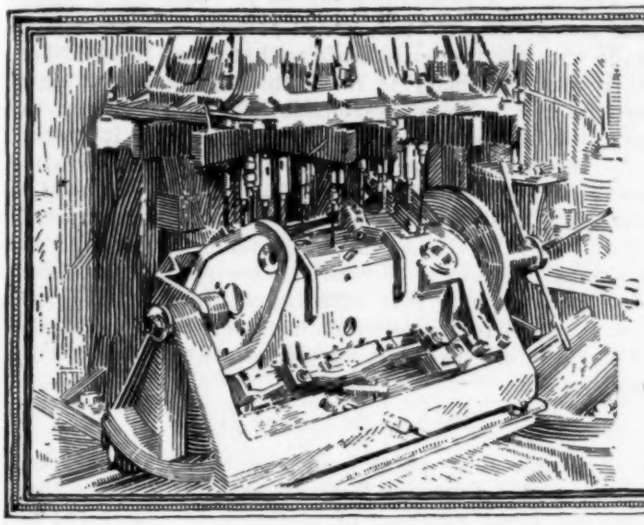
The American firm now using the method sends into the foreign field its export sales manager, who has sample machines shipped to him for use in the principal centers. First an attempt is made to get in touch with a prominent user of this type of equipment, on a trial or demonstration basis, no attempt being made to sell the machine until after it has been running and has demonstrated its utility and economy. In fact, this policy is adhered to so rigidly that the sale of a machine will not be permitted before one has been erected and the demonstration has been carried out. The local-agency problem is handled by placing it with a firm selling supplies to the local industry for which the American machinery is intended.

The advantages of such a sales method are obvious. There is no "overselling" as to the machine's capacity, the buyers making their purchases on the basis of actual accomplishment under their own working conditions, which, of course, vary in the different markets. The best proof of the value of the method rests in the success of the American manufacturer, who has developed a trade in many parts of the world along these lines without ever having a dissatisfied customer. Only machinery that is right and is suitable to local needs can be sold under such a policy.

Naturally one of the most important features is the confidence which is immediately built up in the minds of prospective buyers when they see that the manufacturer has sufficient confidence in his product to send out machinery without any definite sales being in sight. This confidence is increased by the presence of a trained and qualified expert who can superintend the erection of the equipment, as well as instruct purchasers in its operation. While this method may not be suited to all lines of industrial equipment, it is suggested that it might well be followed by more manufacturers interested in South African and other foreign markets.

Study of Quenching Mediums

The object of a new investigation started by the Bureau of Standards during the past month is to obtain more complete information than is now available on the cooling properties of the ordinary quenching liquids used in the heat treatment of steel. It is also hoped that some information bearing on the subject of dimensional changes, occurring during the hardening of steel, will be obtained. The preliminary work has been devoted largely to setting up the necessary apparatus, but a few preliminary experiments have been carried out on quenching nickel cylinders in water with very satisfactory results. As the preliminary work is now practically completed, it is hoped that considerable progress will be made on the main investigation during the next few weeks.



Tool Engineering

By

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Solid, built-up, plain and limit snap gages—Principles of thread gages and their application—Plug and taper thread gages—Methods of gaging screw threads

A GREAT many forms of snap gages can be purchased in different sizes, so that the designer is not called upon to make them up except when the work is of a more or less special nature or when something of the variety desired cannot be purchased. One of the principal things which must be considered when designing gages of all kinds is their strength and rigidity. Any type of gage which is so light in construction that it springs or is distorted when in use must be avoided. A very simple type of snap gage is shown at *A* in Fig. 529. This gage is cut out of sheet steel and it is used for measuring the dimension *B* shown on the work *C*. This type of gage has no limits and the judgment of the operator is required. In addition, there is no means of upkeep on the gage, and when the gaging surfaces have been worn slightly it would be necessary to anneal, reforge or peen, reharden and finish to size once more before the gage could be used. This process would require almost as much time as the making of a new gage, hence for work in quantities any such design is objectionable.

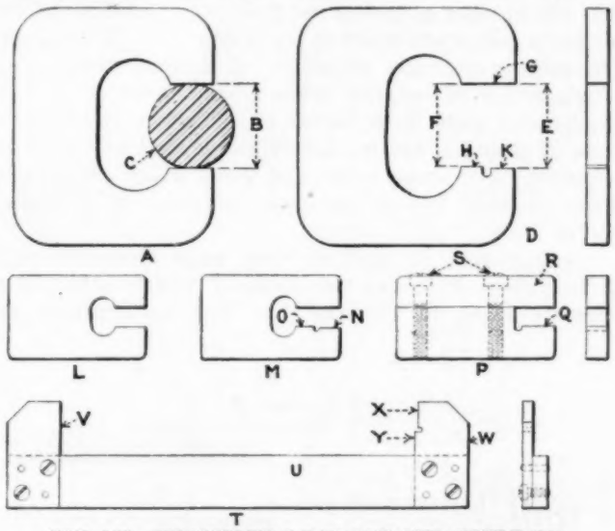

FIG. 529—EXAMPLES OF PLAIN AND BUILT-UP SNAP GAGES

Another gage of similar form, shown at *D*, is of the limit type, the high and low limits being represented at *E* and *F*. The anvil *G* is perfectly plain but those on the other side of the gage are relieved as at *H* and *K*. Care must be taken by the designer to make sure that the high and low limit shoulders are not too close together, as it might not be possible to use the gage unless proper allowances were made. A type of snap gage without limits and of a kind often used for gaging flanges or work of similar nature, is shown at *L*. As this gage has no limits, the judgment of the operator is necessary when using it. The example at *M* is of the same general form, but has limits as shown at *N* and *O*. Both of these gages are open to the same objections as those previously mentioned.

In order to make up snap gages of a form which permits longer life, a built-up type like that shown at *P* is

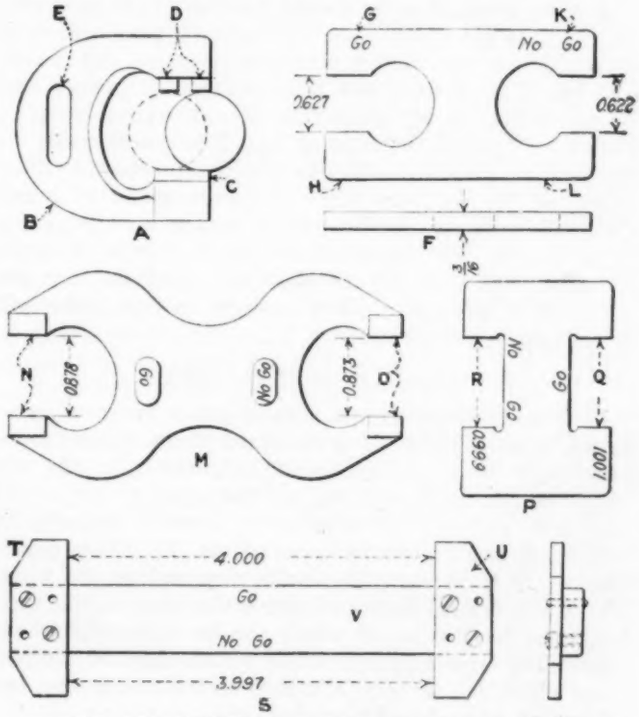

FIG. 530—SEVERAL TYPES OF SNAP GAGES

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often used. The anvil in this gage, shown at *Q*, is made up and relieved as indicated. The opposite jaw of the gage *R* is a separate piece which is screwed to the other by means of two screws *S*. Dowels are also used to obtain the correct relation. When worn it is possible to remove the portion *R* and regrind the face, thus

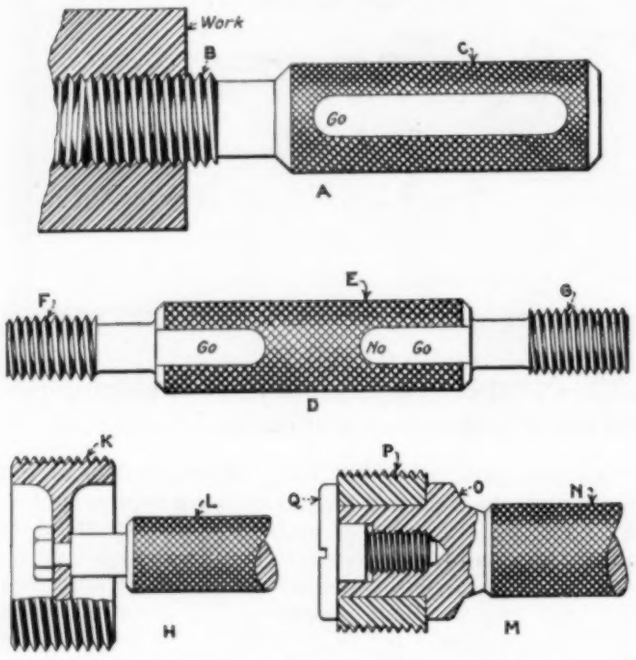

FIG. 531—TYPES OF THREADED PLUG GAGES

bringing it back to the original dimension. Gages of this sort are often made in three parts instead of two, using a filler block between the two sides of the gage. A great deal depends upon the purpose for which the gage is made and whether it is to be used for only a few pieces or for a great number. Limits can be provided by using a double-end gage or both sets of jaws can be made at one end, depending upon conditions.

A snap gage of a somewhat different type is shown at *T*. This gage also is of the built-up type, and it is designed for measuring across a piece of flat work. The bar *U* is of steel, and at each end of it jaws *V* and *W* are attached by means of screws and dowels as shown. The limit portions *X* and *Y* are both made on one jaw in order to simplify the construction. Other gages of the built-up type are often made in many forms, depending upon the shape of the work which is to be gaged. The greatest care must always be taken to make sure that the material used and the size are sufficient to provide rigidity enough, so that there will be no spring during use.

Examples of Snap Gages

In Fig. 530 are shown several other types of snap gages, some of them being standard forms which can be purchased from various manufacturers. In the example shown at *A* the body of the gage *B* is made of cast iron and has a hardened anvil at *C*, opposite to which are two adjustable gage points *D*. These points can be set to produce the limits required on the work. There are several forms of gages like this on the market, some having points which can be adjusted without regrinding and lapping, while others are of simpler form which are set approximately to the size needed and afterward ground and lapped to suit.

Provision is generally made on all gages for a stamping pad as shown at *E*, which permits of marking the gage with the proper number so that it can be identified. It it also customary to mark the high and low limits on the pad. There is considerable difference in the practice of marking gages, but in general it is considered an advantage to mark the sizes on a separate piece of brass or aluminum which can be fastened to the gage and removed or replaced without great difficulty. It is advisable for the designer to consider the marking of every gage which he designs. It is a peculiar circumstance that oftentimes the smallest gages are required for parts which have very long names, and it is therefore necessary to abbreviate markings as far as possible.

Simple Limit Snap Gages

A simple sheet-metal snap gage of the limit type is shown at *F*. Gages of this sort are useful where there are not great numbers of pieces to be inspected; but there is no upkeep to the gage, and when the anvils have been worn so that the work is not held within the necessary limits, the gage must be discarded. The designer should always be careful to provide sufficient metal to back up the jaws, as shown at *G*, *H*, *K* and *L*, in order that gages will not spring when in use. Provision must also be made so that there is plenty of room for the grinding wheel to pass in between the anvils, in order that grinding or lapping can be readily accomplished.

A very familiar form of limit snap gage is shown at *M*. This gage is a drop forging and it can be bought in various sizes as needed. The anvils at *N* and *O* are machined to approximately the sizes required, making due allowance for grinding and lapping. There are many cases when gages like this can be used, providing that the number of pieces required is not excessive; and for parts which are made in small quantities these gages are quite economical although, of course, there is no provision for adjustment when worn. Another type of sheet-metal gage is shown at *P*. The two sides of the gage at *Q* and *R* are machined and lapped to the limits required. For small parts and work which is not produced in large quantities, gages of this sort are often useful.

Another type of built-up snap gage is shown at *S*. This type of gage has two anvils *T* and *U* attached at opposite ends of the bar *V*. The anvil strips are

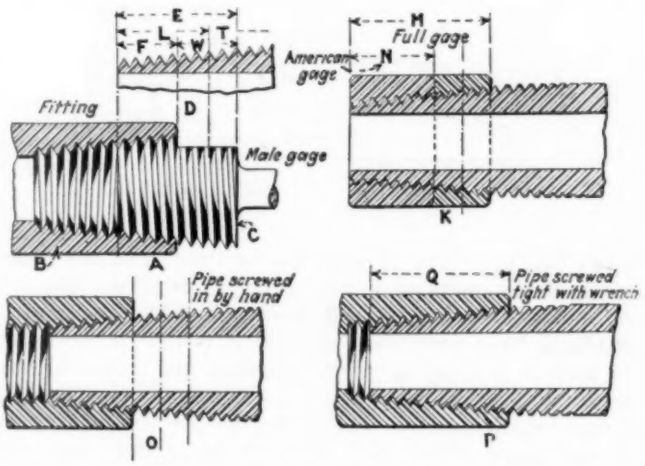

FIG. 532—PRINCIPLES OF GAGING APPLIED TO TAPER THREADS

screwed and doweled to the bar, and the limits are made between the gage points so that the go portion is on one side and the no-go on the other. It is often necessary to make up gages of this sort for measuring across shoulders or other work of a similar character.

External and internal threads are both difficult to gage, as there are so many factors to be taken into consideration in the gaging of a thread. When a diameter is to be measured either outside or inside, it is only necessary to find out whether the work is cylindrical and whether it is within the limits specified or not. In gaging a thread, however, there are a number of points which must be determined and all of these points are important in finding out whether the work is satisfactory or not. The designer should understand these various matters, and for this reason we give herewith sufficient data so that an understanding of the requirements will be gained.

Requirements in Thread Gaging

(1) *Outside Diameter of Thread.*—It is evident that a screw could not be assembled in a tapped hole if it were to be made too large, and conversely, if the diameter were too small the fit would be loose on the thread and would be generally unsatisfactory. For these reasons the outside diameter must be measured.

(2) *Pitch Diameter*—The diameter on the pitch line is important and the dimensions of this portion must be carefully gaged. Too great an amount of variation in the pitch diameter causes a loose or a tight thread and one which will not give good results.

(3) *The Angularity of the Thread*—This is an important point, as different angles in the male and female members would be likely to cause a wedging action and

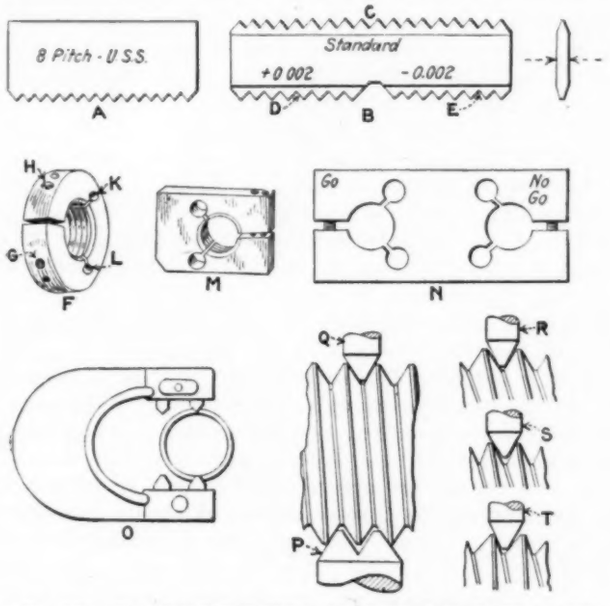

FIG. 533—ORDINARY TYPES OF THREAD GAGES AND THEIR APPLICATION

an unsatisfactory piece of work. Trouble is not usually caused by this matter, as it is comparatively easy to establish the angles of the thread when machining.

(4) *Lead of the Thread*—This item is one of the most important considerations when gaging either external or internal threads. The amount of tolerance which is permitted in the lead of a thread cannot be great, or it would cause a very bad wedging action which would be objectionable.

(5) *Root Diameter of the Thread*—This is the smallest diameter of the screw and it is taken at the bottom or root of the thread. The measurement is obtained at right angles to the axis of the screw. Naturally if the screw thread has not been cut deep enough, it cannot be assembled with its mate.

The points mentioned here are the most important as

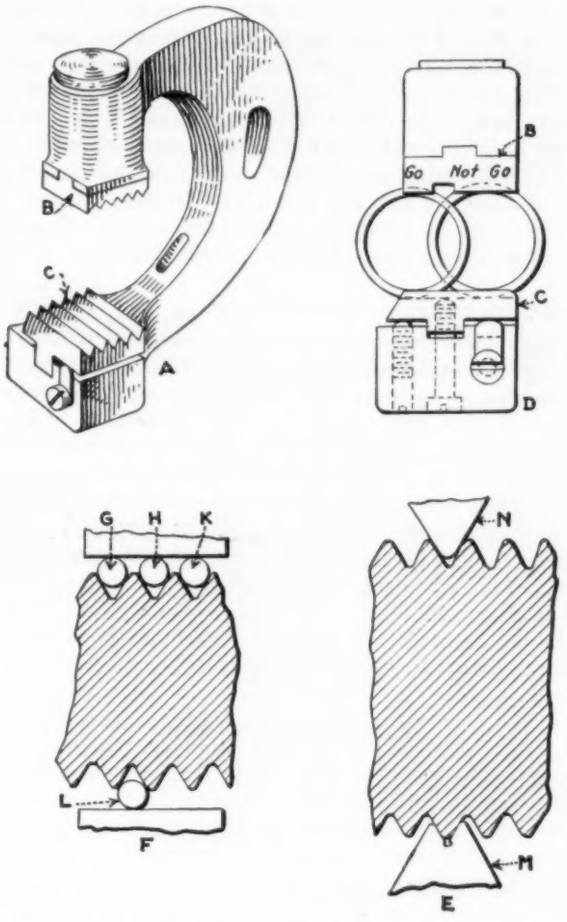

FIG. 534—SEVERAL METHODS OF GAGING THREADS

applied to those gages which are used for screw threads. A complete system of gaging should theoretically test all of these elements. In actual practice, however, the pitch diameter, the angle of the thread and the lead of the thread are the points which call for the most careful attention. The permissible errors in these elements are dependent largely on the character of the work which is being manufactured. As we are chiefly concerned with the design of gages for screw threads, it is not necessary to enter into a discussion of the tolerances which have been established by different manufacturers for screw threads. American manufacturers have adopted no fixed rule, although several concerns have established tables of tolerances which have been found to fulfill the needs of their particular products.

In the manufacture of thread gages a somewhat greater amount of tolerance must be permitted on account of the distortion and changes caused by hardening. Thread gages wear much more rapidly than other types, so that it is advisable to give as much manufacturing tolerance as possible. There has been no definite rule established to determine a safe amount, but in general the lead will pass inspection if held within a tolerance of 0.001 to 0.002 in. The pitch diam-

eters should not be permitted to vary more than 0.0001 to 0.00025 in., depending upon the size. The angle of the thread is generally held to very close limits because it directly affects the pitch diameter; therefore the limits should not be greater than those provided for the pitch diameter of the thread.

Several simple types of threaded plug gages which are in common use are shown in Fig. 531. In the example *A* the gage is made entirely of one piece, threaded at *B* and with a knurled handle *C*. A gage of this sort has no limits and is simply used to test a hole to make sure that the screw will enter it. The judgment of the operator is a factor when using this gage. The example shown at *D* has a knurled handle *E*, and at each end there are threaded portions, *F* and *G*, which are made with limits to establish the sizes desired. Gages of this sort may be made up in unit form or the threaded plugs may be made separately and inserted in the handle.

For work of larger diameter a gage may be made up like that shown at *H* in which the threaded member *K* is fastened to a handle *L* of suitable form. The method of fastening is optional with the designer. The threaded portion of this gage is of uniform section in order to avoid distortion in hardening as much as possible. Another type of gage for larger diameters is shown at *M*. In this case the handle *N* and the portion *O* may be made of aluminum if desired, and the threaded portion *P* held in place by means of a special screw *Q* as indicated. The advantages of this type of gage are the lightness obtained and the ease with which replacements can be made when worn. Other methods of fastening the threaded portion in place can be used if desired.

Taper Thread Gages

One of the most common forms of taper thread is that used for pipe work, although there are also straight pipe threads which are gaged in the same manner as any straight thread. In determining limits on pipe thread gages it must be remembered that the gage would be tried in or on the thread by hand, whereas the work itself when in use as a pipe fitting or connection would be screwed together by the use of a pipe wrench. For this reason due allowance should be made in the gage to take care of this condition.

Fig. 532 shows several diagrams of taper threads and illustrates points of importance in connection with their gaging. In the diagram *A* the fitting *B* is being tested by means of a male thread gage *C*. In the sectional diagram at *D* the dimension *E* is the total amount which the male pipe enters the female when screwed up tightly by a wrench. The dimension *L* indicates the full length of perfect threads, while dimension *T* indicates two threads more than *L*. Dimension *F* is the distance that an "American Briggs Ring" should screw onto the pipe, and the amount *W* is the distance which must be screwed up by a wrench to form a tight joint. The total distance *E* is the thickness of a "Full Briggs Ring" which gages the entire thread.

The "American Briggs Ring" used for gaging is recommended by the A. S. M. E. This gage, being thin, allows for imperfections existing in the front threads of a pipe die, yet makes certain that the small end of the pipe will be flush with the small end of the gage when it is threaded correctly. An allowance is usually made of one thread plus or minus to provide the tolerance. As a general thing it is not advisable to manufacture pipe thread gages, as they have been standardized to such an extent that they can be purchased at very reasonable prices.

Referring to diagram *K* the difference between the positions of the Full and American gages is clearly shown at *M* and *N*. The difference between the positions of a pipe screwed in by hand and that made up tightly by means of a wrench, is shown in the diagrams *O* and *P*. It will be seen that the latter has entered the female member a distance indicated by the dimension *Q*. The example at *O* shows a considerable difference in the distance entered.

Application of Thread Gaging Principles

In order to illustrate the principles of thread gaging, several diagrams are given in Fig. 533. Let us assume that an 8 p.i., U.S.S. thread is to be gaged, and that we wish to make certain that the pitch of the thread is correct. A templet form such as that shown at *A* can be applied to the thread, and slight errors in the lead will not ordinarily be apparent. A gage may be made up of sheet metal for determining whether a thread is 8, 10 or 12 p.i., and it will show this distinctly. It cannot, however, be relied upon to determine errors in the lead of the screw. The form shown at *B* can be used to obtain a rough approximation of the condition, and the portion *C* can be standard while those at *D* and *E* are, respectively, over and under the lead 0.002 in. A great deal depends upon the operator who is using gages of this sort, but such gages cannot generally be relied upon except in the hands of a man who is accustomed to their use.

The example shown at *F* is a plain ring thread gage which is made up in the form shown and provided with adjusting screws at *G* and *H* which permit it to be expanded or contracted as desired. This gage is also cut at *K* and *L* to provide for expansion. Another type of gage made on a similar principle is shown at *M*, the only real difference between this gage and the one previously shown being in the general shape of the gage. Neither of the gages *F* and *M* are provided with limits, but the same principle can be used to make limit gages by employing a construction like that shown at *N*. Here the gage has a threaded portion at each end, and these threaded holes are made of suitable size to provide the necessary tolerance.

A thread limit snap gage for determining pitch diameters of threads is shown in the diagram at *O*. This gage is a patented type having an anvil consisting of two points as indicated at *P*, and opposite to this anvil and midway between the two points there is a point *Q*. The advantages of this type of gage are that there is much less chance for errors which might be caused by drunken threads or thread angles which are too sharp or too blunt. These conditions are indicated at *R*, *S* and *T*.

Difficulties of Gaging Threads

The example *R* indicates the contact which would be obtained by a gage point in the event that the thread angle were too obtuse. In the example *S* the angle of the thread is too acute, while in the example *T* the thread is "drunken" and the angle on one side is different from that on the other. It must be remembered by the designer that the gaging of screw threads is almost a science by itself, and we are only giving some of the fundamental points which are of importance with respect to the subject, as a lengthy discussion would

require too much space and for this reason would be prohibitory.

Several applications of gages to the measurement of threads are shown in Fig. 534. The example at *A* is a type of off-set gage having anvils *B* and *C* which are threaded to correspond with the pitch of the work being tested. This gage is patented and the advantages claimed for it are convenience of operation and long contact with the thread, which enables the operator to readily detect errors in the lead and pitch diameter of the screw. The end view, shown at *D*, gives a good idea of the general construction. The anvil *B* is tongued so that it fits the body of the gage. One side of this anvil represents the go portion, while the other side is for the no-go part of the gage. The lower anvil *C* is so arranged that it can be tipped and tilted to compensate for wear, and also for adjustment. This method of fastening gives longer life to the gage and permits resetting when worn. The anvils are removable and replaceable so that different pitches and diameters can be supplied.

Use of Wires in Thread Gaging

The use of very accurate wires in measuring threads has been proven one of the most successful methods. It is necessary when using this system to obtain wires of very accurate diameter, and after they are laid in the threads on opposite sides of a screw, the measurement can be taken across the wires. The advantages of this method of measuring are that the measurement obtained bears a definite relation to the theoretical root of the thread on each side of the screw. After obtaining this measurement, the actual pitch diameter can be readily determined by working out a simple problem in trigonometry.

In the example shown at *F* a sectional view is taken through the center of a screw, and wires are shown at *G*, *H* and *K* on one side and at *L* on the other. The ordinary method of measuring is to place two wires at *G* and *H* and a third wire opposite to them and midway between them at *L*, and then to measure across the wires by means of micrometers. A test can be made for defective threads by using three wires on one side and one on the other as shown, and then noting whether any of the three wires are loose or whether they are perfectly tight. In a theoretically perfect thread and with wires very carefully gaged, the anvil and the micrometer should bear with the same amount of pressure on all three wires. As a general thing, however, only the two wires *G* and *H* are used on one side of the thread and the wire *L* on the other.

Special Measuring Points

An attempt to obtain a somewhat similar result by means of special measuring points is shown in the example *E*. Here one of the micrometer anvils is cut out as shown at *M*, so that it will straddle the thread. The other anvil of the gage is made like that at *N* so that it will enter between the threads. A very good approximation of the diameters can be obtained by this method. As previously mentioned, we do not consider it desirable nor necessary to go into the theoretical gaging of screw threads to a great extent, as this subject would require more space than appears desirable from the viewpoint of the tool engineer. We have, however, taken up some of the principal points which must be considered in gaging screw threads and others will be mentioned under the heading of Inspection Gages.

Sound Advice on Foreign Selling

The results of an extensive trip abroad for the purpose of selling goods, arranging agencies, or similar purposes, frequently are nullified through the fact that too little time is allowed for stops at the various places to be visited, states an editorial in *Commerce Reports*, published by the Bureau of Foreign and Domestic Commerce.

It sounds like a truism to say that it is impossible to secure full advantage of a commercial trip in foreign countries unless ample time is employed to do the job well. Nevertheless, there are numerous instances of expensive journeys abroad that have been largely ineffective because the traveler has not stayed long enough in the several cities. This is all the more lamentable when a small additional expenditure of time and money might spell the difference between failure and success.

There are still a considerable number of business men in the United States who believe it feasible to make a commercial circuit of South America and be back in New York within two months from the date of departure. It seems scarcely necessary to say that such a "whirlwind" trip is not likely to garner much business.

Plenty of time should be allowed for the field to be thoroughly covered, with a margin for contingencies. One should not lose sight of the fact that practically a whole day is frequently required in disembarking from a steamer and getting installed in a hotel. The traveler should make a special effort to become as cordially acquainted as circumstances permit. The benefits of a personal acquaintanceship are likely to be very real. It is well to keep this bond intact after one returns to the United States. Seasonal greeting cards and an occasional personal letter, as occasions warrant, are valuable factors in maintaining contact with acquaintances abroad.

Mathematical Equations for Heat Conduction in the Fins of Air-Cooled Engines

Report No. 158 of the National Advisory Committee for Aeronautics, prepared by D. R. Harper, 3rd, and W. B. Brown has just been issued by the Government Printing Office. It deals with the problem of reducing actual geometrical area of fin cooling surface, which is, of course, not uniform in temperature, to equivalent cooling area at one definite temperature, namely the temperature prevailing on the cylinder wall at the point where the fin is attached to it. To consider all of the cooling surface as if it were a part of the cylinder wall and 100 per cent affected is made possible by this method of treating the problem.

The essence of the paper is an examination into the magnitude of errors involved in using mathematics in a convenient form, and a determination of the corrections which are necessary for accurate work. The mathematical expressions involved are quite complicated, but the results of the work are collected in graphical form in a series of charts, so that the engineer can use the simple formula developed, and apply to it corrections readily obtained from the charts, thus entirely avoiding all higher mathematics.

A copy of this report may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

Need of Straightening in Automobile Repair Work

By Donald A. Hampson

BECAUSE the automobile business "looks good" to them, many machinists give up their positions and go into the repair departments of garages. As many more cast longing eyes in the same direction but hesitate about leaving steady work for jobs in a seasonal business.

But before making the change, machinists ought to consider well all sides of the matter. It is all right to add automobile work to one's store of experience, though if this is the only reason for making a change, the disadvantages outweigh the advantages and the machinist who has a car of his own—most of them do—can get nearly all the experience from it that he needs aside from shop work, and that is the same for an automobile shaft as for a saw mandrel.

The disadvantages of the business, as a trade, are the letting down of standards and discipline, the dirty character of the work, and the hours. Except in the relatively few big garages and service stations where mechanics work regular shifts and where each man is assigned to a certain job, such as a lathe job or a floor job, these unfavorable conditions obtain. In most garages, the mechanics have to do all sorts of crawling in the dirt and grease and they never know when they can quit at night. Sandwiched in are occasional particular lathe or milling or grinding jobs.

If a machinist has the initiative and foresees a time when he will establish a garage and repair business of his own, then the experience outlined is not as serious. But even before embarking on this career, the machinist without business experience ought to seek the advice of a banker or business man who is able to point out the effects of competition, the losses that every business must bear, and the hundred items, unthought of, usually, that have to be paid for out of the hourly charges for work.

Some machinists break away from the craft and go in for battery work or radiator work or tire repairs or the gas-and-oil station. Others start a repair business in a vacant barn, with no other equipment than hammer and pliers. Occasionally, a man who has saved his money buys a cylinder grinding machine and goes in for a special line of work that is in keeping with his skill and training as a machinist. On general principles, a specialty can be worked up into a profitable trade, more so than any other form of repairs.

Need a Shop for Straightening

There is one line of repair work that is practically untouched so far as specialization is concerned, yet is peculiarly adapted to segregation and placing in a one- or two-man shop. There is a never-ending volume of straightening to be done, and it can be made to pay much better than ordinary repairs.

The "straightening shop" is badly needed in the automobile repair business and the machinist of ability in that line will be received with open arms. The wear and tear of everyday running, the uncorrected loosenesses, clean breaks, little accidents of driving, and all the happenings included under the name of "wrecks" serve to feed the job list of the straightening shop.

An expenditure for equipment that would put in only the gas tank and pump of a garage or would but poorly equip another specialty shop, will fit up the place in first-class shape for straightening. The shop can always be started with one press, adding to this as business warrants, or a complete equipment can be installed at the start if financial arrangements suit. A list of equipment follows:

Screw straightening press with attached centers.
Garage press for general pressing and straightening.
Heavy vise set on a good solid bench.
Cast iron plate or block about 24x72 in., on bench or on legs.
Second-hand lathe 60 in. between centers, about 18 in. swing.
Lathe in good condition, 12 in. swing, 31 in. between centers.
Anvil and sledge.

There is no single item more expensive than the 12-in. lathe, which is near the end of the list in order of necessity. And such a lathe may be purchased new for $400 or so. The other lathe is a second-hand one. Any of the dealers in the back of this number can furnish a lathe for this work for $200 or less. This lathe would be used for swinging complete rear axles or drive shaft assemblies or crankshafts with the flywheel on. On work of this kind, what is required is the pair of centers upon which to twirl the work and a readily moved part for checking up at any point, the same being the carriage and tool rest. The chances are that a good many times it will be convenient to use a bar, fulcrumed on the toolpost, in straightening a piece held on the centers and for this reason, if for no other, a first-class lathe ought not to be installed in the straightening shop.

The 12-in. lathe is needed for the miscellaneous operations that have to be done on shafts after they are straightened. Sometimes a journal has to be skimmed off to make it straight and smooth before fitting to a bronze bushing, sometimes a thread must be chased where it was battered over in getting the shaft out, and sometimes it is better to take a facing cut off a flange than try to straighten it. For these jobs and for accurately testing parts on their centers a small lathe in good shape is required. Such lathe needs to be long enough to take in an axle shaft.

But the most essential tool in the straightening shop is the screw press which, in most machine shops, is placed on a bench near a window or other location where the light is good. These presses are well known to machinists, but they are little known and little used in garages. They have anvils, or supporting blocks, that are adjustable for spacing to suit any degree of bend. Of great assistance is the graduated dial upon the screw, which enables the workman to repeat a given pressure should it be necessary, and to vary it by known degrees.

A time-saving feature of these presses is the pair of adjustable centers that is attached immediately in the front. By means of them, the workman may "press and test" as many times as may be required but he never has to take a step away in order to check up on the progress of the work.

More valuable than at first appears is the bench block for straightened work. Upon its machined surface, all kinds of checking and squaring may be done. Connecting rods may be checked for alignment and babbitt may be poured. And upon the block the "rolling test" for turned parts may be made, a test that often shows more of the general condition at a glance than the center test does after considerable work. Then, too, it is suitable for testing parts made in automatic machines which seldom have center holes.

Repairing London's Omnibuses

By I. WILLIAM CHUBB
European Editor, *American Machinist*

The first of three articles—Overhauling omnibuses on a production basis—Mileage made and number of passengers carried—Description of shops

OF PUBLIC means of conveyance in London, the motor omnibus has undoubtedly made the greatest headway within recent years and London now has no more dependable service. But only comparatively recently has this been true. Now, thanks to the attention paid to vehicles, the lost mileage through breakdowns is only about 3 miles in 10,000. This result may fairly be claimed as a triumph for the engineer, though achieved at the instance of the police (that is the licensing authorities) whose requirements have always been severe. The London General Omnibus Co. has just off the Chiswick High Road, Gunnersbury, W., an overhaul department with works measuring 857x352 ft. in which every motor bus that has been on the road is periodically taken literally to pieces to repair or renew, as by police regulations this is necessary before passing to the authorities for the annual license for further running.

Prior to dealing with some of the shop methods employed, in order to preserve a sense of proportion, it is necessary to state that the omnibus company forms a section of a London transport combination employing about 32,000 people and has a fleet of about 3,000 motor buses, the largest of which carry 54 passengers each. The buses run more than one hundred million car-miles in the course of a year and the passengers carried amount to a billion. In the shops at Gunnersbury, on a site of 31 acres, with works, offices and canteens covering 16 acres, some 75 buses a week are overhauled though the plant is arranged to do 100 a week and at the moment about 2,400 workpeople are employed. In addition, the garages are supplied with spare engines, gearboxes and other parts.

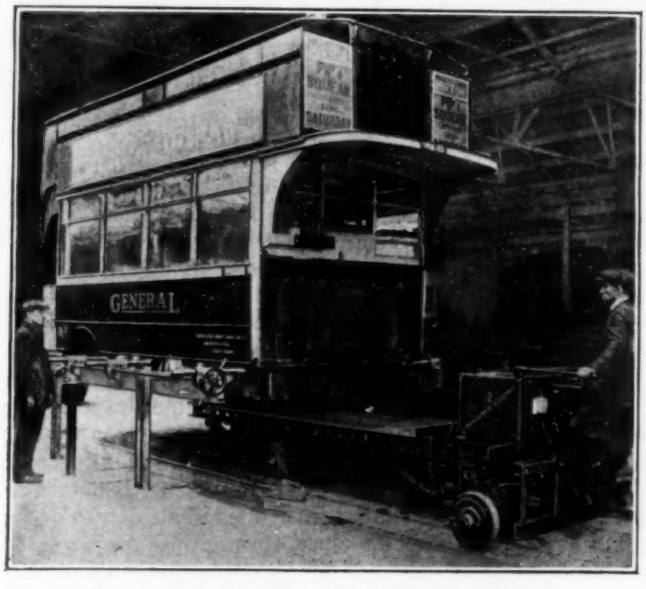

FIG. 1—BODY LIFT AND ELECTRIC TRUCK

Repair work progresses through the various sections with the machine tools grouped to deal completely with a given unit or component, engines of four types, for example, being dealt with on the same line. The company has about 30 garages for buses operating in various districts. Buses are docked and examined about every three weeks and worn parts replaced where necessary, engines being changed every six months and all units and parts supplied from the central overhaul works. The advantage of the central repair shops will be seen in the official statement that before the Gunnersbury plant was operating fully, the average time taken for a complete bus overhaul was 16 days, whereas 4 days is now the usual period. Previously the annual loss in the working capacity of a vehicle was about 4½ per cent; now it is rather more than 1 per cent. The body is attended to in from two to three days but a chassis can be completely overhauled the same day, two hours being required to dismantle it and 3½ hours to rebuild it completely.

FIG. 2—BUILDING STAIRCASE ON JIG

The works are arranged so that the body-building and repair shops are at one end, with the chassis-overhaul section at the other and the stores between. The body side accounts for about half the total of the floor space.

The bus to be overhauled is run by its own power into the body shop on to an hydraulic lift which rises so that the body is lifted and the chassis drives away to the other end of the repair shops. The body is then lowered on to an electric runabout truck (see Fig. 1) and thus taken to the first repair section where by means of the

rising platform of the truck, it is lifted on to steel trestles or stands similar in height to the chassis frames, the electric truck then being driven away. Two men remove a one-ton body from its chassis and place it on the stand in 3 min., whereas eight men took 20 min. when the process of jacking up by hand was employed. The body shop is divided into self-contained sections according to the units. When the body is examined if any detail is found to be excessively worn, damaged or dirty, it is removed and sent to its section for overhaul —mechanical beaters removing dust from upholstered parts—while a previously repaired unit takes its place.

Unlike the chassis, the body progresses as much as possible by the man proceeding to the work, and, generally speaking, in the coach section each man has his own jig and bench on rollers, where this is necessary. Fig. 2 illustrates the building of the staircase on its jig, a complete staircase being shown on the floor. The framework screwed on, the jig representing the back of the bus. Details are added, including the standard tread plates. Usually the body is in the shop for two or three days for repairing, painting, lining and re-varnishing. Excepting in the case of wings and similar units, which are sprayed, painting (5 coats) is by hand because of the various color schemes. The overhauled chassis is then brought into position and the body, wings, guards, advertisement boards, etc., are fitted, completing the vehicle as regards overhaul.

The chassis dismantling is in five stages. Any petrol remaining in the tank is run into an underground store and the tank itself, its housing, the bonnet, radiator, scuttle dash and footboards are removed. Next the front cardans are released, the engine is lifted out, the exhaust pipes and silencer being taken down. At the third stage the steering column, speed gear, hand brakes and front brake rods are removed. Next the gearbox and the rear cardan are removed, and in the fifth operation the front and rear axles are taken away and the frame, after being cleaned, is placed before the viewers. At each position, as the units are removed they are stripped and then cleaned before passing to the viewing section.

For cleansing purposes the chassis parts are put through the washing machine shown in Fig. 3. Placed in wire baskets if small, the parts are in any case carried on a chain conveyor through a tunnel formed by a circle of 23, 1½-in. horizontal pipes, 12 ft. long, which are perforated along their full length with ⅛-in. holes 4 in. apart, providing cleansing jets. The tunnel thus formed is above a galvanized-iron tank, about 13 ft.x3 ft. 6 in.x2 ft. 6 in., containing hot water. A steam-proof detachable cowling covers the structure. Another smaller tank alongside acts as a settler and filter, five renewable filter plates being formed of gauze of varying mesh. A 6-in. Albany gear-pump driven by a 20-hp. electric motor, draws the water through the filter and delivers it to a cylindrical header, forcing it through the pipes and jets. The chain conveyor is itself driven from an extension of the pump shaft through a slipping-plate clutch to prevent breakage by jamming of the conveyor.

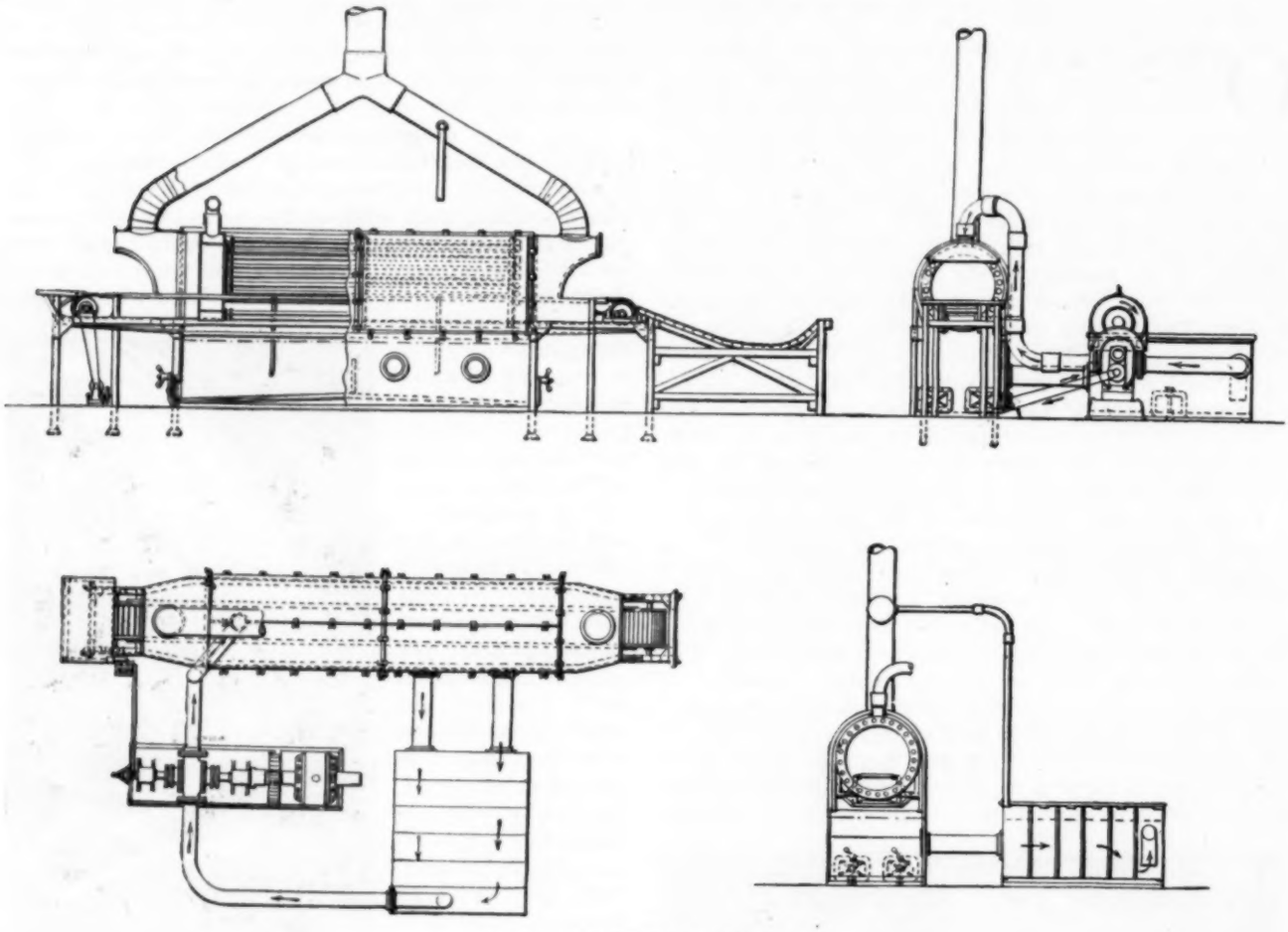

FIG. 3—WASHING MACHINE

The pump delivers 22,000 gal. an hour and the conveyor takes 5 min. to traverse the tunnel. The water is heated by the admission of steam into the main tank. At the delivery end of the washing machine is a distributing table onto which the basket or article cleaned is delivered by the conveyor, the attendant sorting out the parts according to the various units to which they belong and rotating the table to the different runways to the viewing sections where they are then examined as to further usefulness.

A dab of green paint indicates that no repair is needed, blue paint that the part is fit for repair, and red suggesting scrap. For determining whether worn parts can still be employed, jigs and limit gages are in use. Condemned components or units are immediately removed so that all scrap material is kept together and cannot pass into the repair section. Certain worn parts, such as splined shafts, stub axles, etc., are in some instances built up again by the electro-chemical deposition of metal, this relating to parts that are deficient by 0.1 in. on the diameter as a maximum. The parts treated are then machined to standard.

For dismantling purposes the chassis is pushed from one position to another parallel with the end wall, and after stripping and viewing the details, travels at right angles (that is parallel with the length of the building) the units being lifted off by overhead gear. The engines are placed on trestles with rollers to move on rails from one man to another as details are removed. Material, engines and gearboxes are moved through the shops by mechanical conveyors and runways, many parts being simply pushed from one position to another. The speed of both the engine and material conveyors is 6 ft. a min. The view of the gearbox runway given in Fig. 4 illustrates the fact that by means of a central plunger lifted by a hand lever, the case can be revolved so as to be dealt with completely by a man on one side of the runway, the box rotating on the plunger pin. Formerly it was necessary to have two sets of men, one at each side of the runway. In this runway the last section is hinged so that the truck which carries the gearbox can, when empty, gravitate back along lower rails to the opposite end. Fig. 5 illustrates the front-axle conveyor. The machine lines terminate near the chassis assembly conveyor or float (220 ft. long x 8 ft. wide), which is level with the floor and travels at 14 in. a min. Here the heavier parts are placed in position by the use of overhead runways and the chassis when assembled and after test runs back to the body shop for mounting the body.

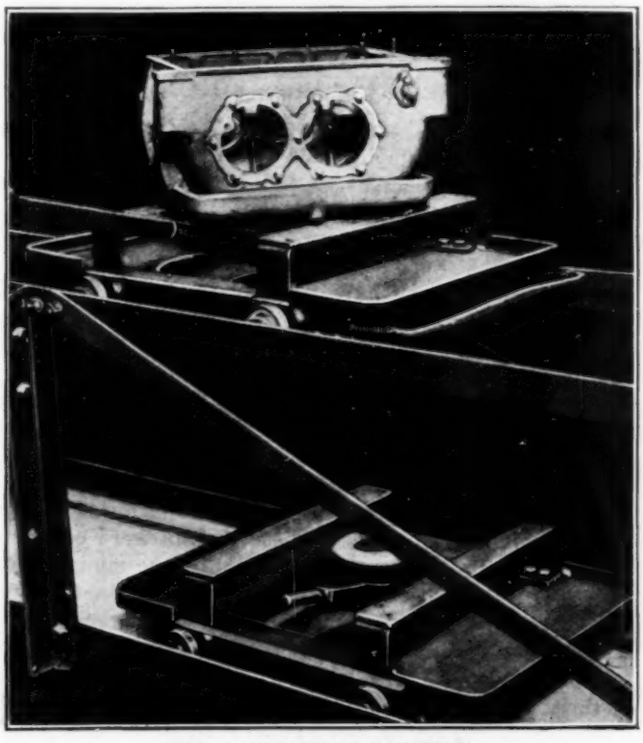

FIG. 4—GEARBOX RUNWAY

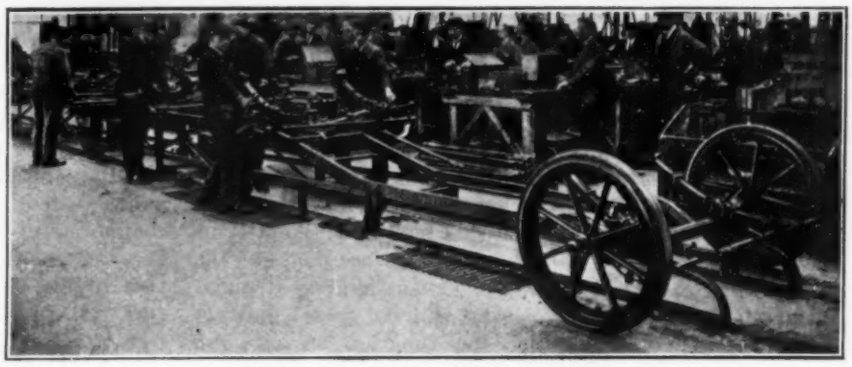

FIG. 5—FRONT AXLE RUNWAY

Strength of Wire Rope Over Sheaves

Wire rope in actual use is generally weakest at the points where it passes over sheaves, especially those of small diameter, but hitherto few strength tests have been made under these conditions, although many have been made on the straight rope. The Bureau of Standards has made tests under these conditions, the rope being connected between two sheaves, one on each head of the testing machine. The rope was socketed and was made continuous after placing on the sheaves by joining the sockets.

Under the load it was found that the rope usually broke where it left the sheave. Ropes used were ⅝, ¾, ⅞, 1 and 1¼ in. in dia., and the sheaves were 10, 14 and 18 in. in dia. It was found that the strength of the rope was less, the smaller the sheave. Taking the strength of the straight rope as unity the strength of the ⅝ in. rope over sheaves was 87.4 per cent for the 10 in. sheave and 95.3 per cent for the 18 in. sheave. The larger ropes had a much lower strength, as the 1¼ in. rope had a strength of only 75.8 per cent on the 10 in. sheave and 84.7 per cent on the 18-in. sheaves.

Some of the tests were made under repeated loads representing approximately the working loads; others were made under loads which were gradually increased to the ultimate. The elongation and decrease in diameter were measured and conclusions drawn about the behavior of wire ropes under service conditions.

It is probable that one heavy load squeezes more lubricant out of the core than does a lighter load repeated many times. Rapid wear of the wires may result from this loss of the grease which was provided to lubricate them.

The results of these tests are embodied in Technological Paper No. 229 of the Bureau of Standards, which can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is 10 cents.

The Safety of Flying

By John F. Hardecker

THE PUBLIC is still dubious about the safety of flying despite the fact that the Aeromarine Co. has operated commercial airplanes over definite routes for over a year with but one serious accident. Perhaps the largest contributing factor to this feeling of skepticism is the daily press to which an airplane accident is still a front page feature. However just as long as airplane accidents are good news, so long will the press continue to feature them, and since the function of all good newspapers is to print all the news, we can only endeavor to look beneath the surface to find that which is so hard to get at the time of the accident, namely, the underlying causes and see if they justify the feeling that flying is not yet safe.

One of the greatest operators of airplanes is our own United States Navy Department. During the past fiscal year Navy airplanes and seaplanes have flown a total of 39,338 flying hours, which at an average speed of 100 m.p.h. would be equivalent to 3,933,800 miles. Despite the fact that the major portion of this flying has been done under extremely severe conditions the total number of accidents or crashes (including minor mishaps), has been only 108.

Each time that there was an accident a full investigation was made, and a report rendered as to the cause of the mishap. The table herewith gives a complete detailed resume of the causes of crashes for the fiscal year of 1921-22.

CAUSES OF CRASHES

Hazards of Operation		
Bad landing	25	
Spin	15	
Collision	6	
Taxi-ing (Collision on water)	6	
Side slip	5	
Weather conditions	4	
Burning of plane (in air)	1	
Burning of plane (on ground)	1	
Gasoline exhausted	2	
Nose dive	2	
Stall	2	
Glassy water	2	
Bad take-off	1	
Poor pilotage	1	
Spiraled into water	1	
Failure to recover from a deliberate spin	1	
Skid	1	
Total number due to hazards of operation	76	76
Engine Failure		
Structural	5	
Loss of oil pressure	4	
Stoppage in gas feed	3	
Ignition system	2	
Not known	2	
Overheating	1	
Total number due to engine failure	17	17
Structural Failure		
Pontoon	4	
Hull	1	
Landing gear	1	
Rib	1	
Total number due to structural failure	7	7
Not Known	8	8
Total number of crashes		108

It is interesting to note from this classification that 70 per cent of the crashes were due to hazards of operation. When we consider the large percentage of flying in the Navy department which is done in training new pilots, testing new machines with which the pilot is not familiar and doing stunt flying while new machines are being tested, is it not reasonable to suppose that in commercial flying this item could be materially reduced? If we add to this the fact that commercial landing facilities are being constantly improved it seems logical to contend that the major portion of these accidents due to hazards of operation are peculiar to naval operations, and do not have a similar possibility in commercial flying. Therefore we must correct our first impressions about the safety of commercial flying as gained from our gleaning of the newspaper reports of naval and military airplane crashes.

The fact that only 17, or about 16 per cent, of the crashes were chargeable to engine failure, argues well for the present development of the airplane engine. Seventeen engine failures in nearly 4,000,000 miles of flying is a wonderful tribute to the manufacturers of our airplane engines. The best of these engines when applied to commercial aviation will give as good a guarantee against failure as any motive power used in the transportation of passengers or freight.

Structural failures contribution of only 7, or about 6½ per cent of the total failures gives us every assurance that our designers, despite the necessity of saving every possible pound of weight for useful load, are not sacrificing safety to cut down weight.

In conclusion, it is evident that such data as the Navy department has just compiled takes us behind the scenes as to the causes of airplane crashes, and lets in the light so that we can really appreciate the fact that flying under proper commercial conditions can be made, and is being made, safe for all of us, and that we must not attribute too great an importance to the crashes which do occur in fields of endeavor where the risk is peculiar to that field.

Scratch Hardness of Copper

The Bureau of Standards is conducting an investigation of the instrument used for the determination of the scratch hardness of metals, and in connection with this work, considerable attention was paid during the past month to the effect of various amounts of cold working on the hardness of copper. The results obtained in cold rolling very pure, electrolytic, unmelted copper and also ordinary commercial copper indicate clearly that the early stages of the deformation of the metal harden it very rapidly. The maximum degree of hardness is soon reached, however, and a reversal occurs, the metal becoming very appreciably softer as the deformation process is continued, so that the metal in its final condition after cold rolling is completed, is softer as measured by the scratch hardness method than in its initial state. These results were confirmed by tests made on the same material by the micro-Brinell method. Annealing cold rolled sheets at a low temperature (100°C.) softens the material appreciably, but the general form of the hardness deformation curve is not affected. The work will be extended to a few other metals to determine whether this behavior is peculiar to copper or more general in its nature.

Industrial Cost Accounting for Executives

BY PAUL M. ATKINS

Article thirteen deals with depreciation and other fixed charges — Methods of calculation — Controlling and subsidiary accounts—Preparation of the journal entries

IN THE preceding article a general survey of the detailed cost accounts was presented, and it is now time to consider more closely some other principal ones, their composition and their significance. The first of the groups of accounts to be taken is that which commonly goes by the name of Fixed Charges. The peculiar importance of these charges lies in their fixity. Whether business is dull or booming they continue day after day without any change. In the sense that they may be determined in advance with a considerable degree of accuracy they do not offer the problem to the management which various variable expenses present. In so far, however, as they are immutable they need careful study and in times of depression often cause many difficulties since, if they are not met when due they may, in fact almost certainly will result in bankruptcy of the company.

The principal elements which make up fixed charges are: Depreciation on fixed assets, property insurance and property taxes. If interest is to be considered as a cost of production it may also be included in the group, though this will depend somewhat on what basis the interest is computed. While not all cost accountants are in accord in regard to the methods of handling the other three items there is substantial unanimity of opinion that they are all properly considered as fixed charges, invariable from month to month during rela-

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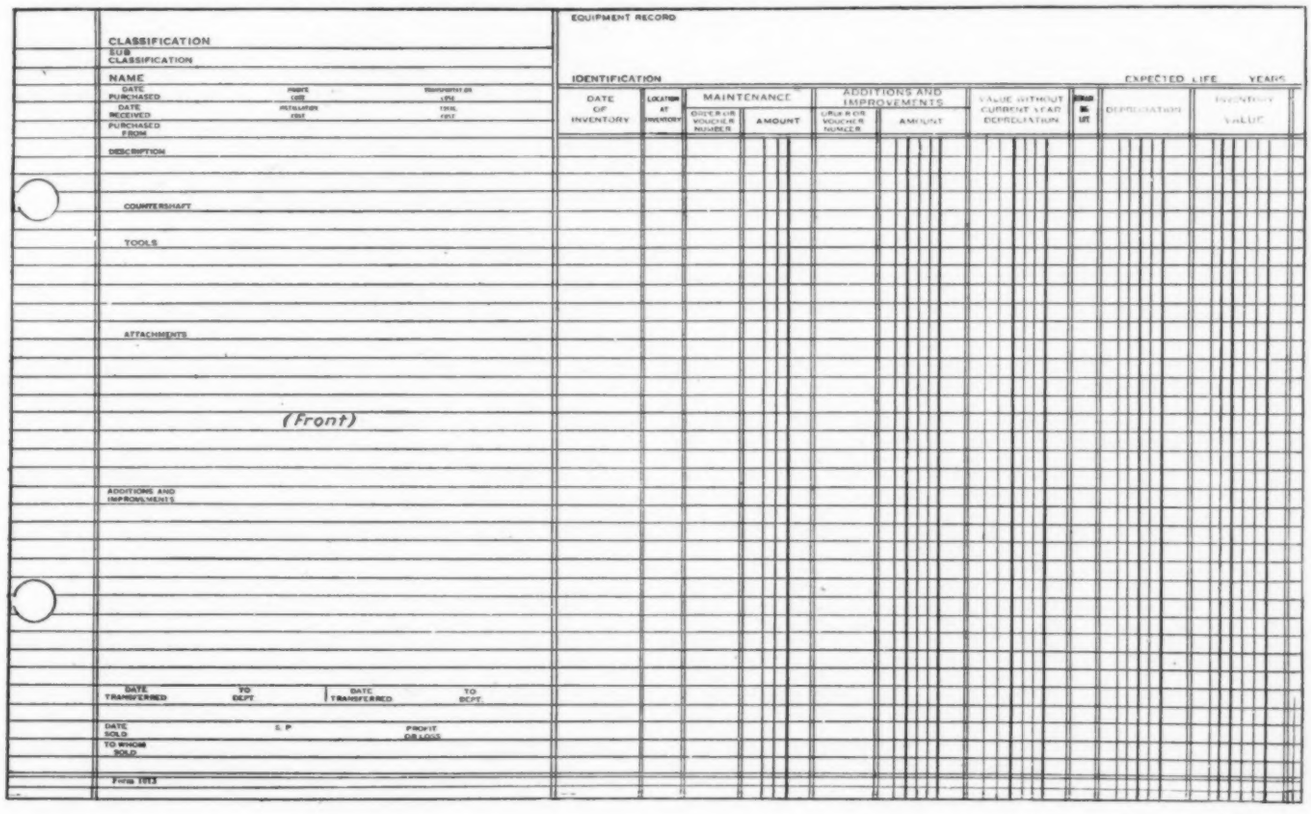


Courtesy of the Union Special Machine Co.

FIG. 38—SUBSIDIARY EQUIPMENT RECORD OR PLANT REGISTER

tively long periods—six months to a year and occasionally longer.

Depreciation from many points of view is the most important of the elements. It is often the largest one of them, and it does not have that same degree of definiteness that the others have. Insurance rates are known in advance, the total amount of the insurance can be calculated to a cent and it may be distributed with a high degree of accuracy. Depreciation, however, is not subject to such exact measurement. It is essentially the loss in value of the fixed assets due to wear and tear, a loss which has not been made good and cannot be made good by maintenance in the ordinary sense of that word. Of course, the careful use and constant repair of equipment or building will prolong its life far beyond that which it would attain if such attention were not given it, but in the end the machine or building will be worn out and must be replaced. The measurement of the rate of the wearing out depends to a certain extent on the judgment of the individual

FIXED CHARGES SCHEDULE SHEET DEPT. MDA.

UNIT NO.	DESCRIPTION OF UNIT	DEPR.	INS.	TAX	TOTAL
	BUILDINGS				
	MACHINERY				
	FURNITURE & FIXTURES				
	Grand Total				

FIG. 39—FIXED CHARGES SCHEDULE SHEET, DEPT. MDA

who is doing the measuring, and hence it is not surprising that differences of opinion exist.

While there are these differences of opinion in regard to the methods of calculating depreciation and of the rates at which it shall be determined, there is no question but that depreciation must not be neglected, and that at some rate and by some method it must enter the cost of production through the expense accounts. In recent years, experience has been rapidly accumulated in regard to the rate at which various kinds of machines and different types of buildings wear out, and on that basis the accuracy of the determination of the rates of depreciation has been greatly increased. Much of the experience has been reduced to tabular form and published, so that it is available for general use, and appraisers who have specialized in the evaluation of certain types of industry have a great deal of additional unpublished information.

Depreciation goes on whether the property is being used or not, and it is astonishing to find how little difference it makes whether it is used or stands idle. Theoretically, of course, depreciation ought to be a great deal less during dull times than during a busy period. When business is slack, however, the tendency is to reduce all expenses as far as possible, and so machines are not oiled and cleaned as often as they should be, and they rust out fully as rapidly as they wear out. If equipment is used for double shifts instead of for single shifts for any great length of time, then we are likely to find that the rate of depreciation has sensibly increased and must be taken account of. In most cases, however, it is not necessary to change the rate during dull seasons. In fact, it is generally incorrect to do so, and the temptation to reduce expenses in this manner should be resisted if really accurate records are desired.

Losses Due to Obsolescence

Another reduction in the value of the fixed assets which has much the same effect on the records as has depreciation, though it arises from an entirely different cause, is obsolescence. Essentially, obsolescence is the loss in value due to the ageing of the article, or, more properly, its going out of style. It is quite possible for a piece of equipment to be in excellent condition and serviceable for a long time to come in so far as its physical condition is concerned, and yet be valueless to the company because new and improved methods requiring different equipment have come into use. It is, of course, extremely difficult to forecast such costs and hence the simplest way to deal with the situation is to set up a special reserve account which may be used as a protection against unforeseenable losses from this source. In some cases, however, the rate of depreciation is increased so as to provide for obsolescence also.

There are several different methods by which the rate of depreciation may be calculated. In all cases, it is necessary first to determine the probable length of life of the asset in question and its scrap or salable value at the end of that period. The simplest method and the one which is most used by industrial concerns is the one known as the straight line method of depreciation. It gets its name from the fact that a graph of its curve plotted on co-ordinate paper gives a straight line. The probable scrap value is deducted from the first cost value and the difference is then divided by the number of years of the expected life of the asset. This gives an amount which is to be charged each year as an expense and credited in turn to the reserve for depreciation account. It is necessary, of course, to divide the yearly amount by twelve to reduce it to a monthly basis so that the debits and credits can be made at the regular accounting periods. The arrangement simplifies the whole accounting record for the matter, and for most manufacturing concerns is just as accurate and satisfactory as any other method which has been devised.

Other Methods of Calculating the Rate

Two other methods are used with sufficient frequency to warrant a brief discussion of them here. One of the methods is known as the fixed percentage on diminishing value method. The length of life and the scrap value are first ascertained as before. Then a per cent is calculated, which, when applied to the *net* value of the asset for the preceding year, will give the amount of depreciation for the current year. The net value used is the cost value less the total amount of depreciation previously written off on the item. This all means that a *decreasing* amount of depreciation will be debited to expense each year for any particular items, because the fixed per cent is applied to a *decreasing* net value of the asset. This is contrary to the facts of the case in most instances, for the equipment does not usually

lose in value due to its wear and tear, so fast during the first few years as later on in its life. On the other hand, it is presented by advocates of this method that the cost of maintenance is likely to be much higher during the later years of the life of the equipment, and so the *total* of depreciation plus maintenance will be approximately a constant amount. The idea is sometimes carried so far as to combine the accounts for depreciation and maintenance, crediting a reserve for depreciation and maintenance account with an amount which is believed will be sufficient to cover both, and then debiting the account with the amount of the repairs. The method is more complicated than the preceding one and, for industrial companies, does not usually give any more satisfactory results, though this is possible under exceptional conditions.

The other method referred to is known as the sinking fund method, and is worked out on the principle of a sinking fund. The total depreciation to be written off being first calculated, an amount is then determined which, if set aside each year and allowed to accumulate at compound interest during the life of the asset, would equal the amount of the depreciation to be written off. The amount to be charged as an expense would be constant while the amount to be credited to the reserve for depreciation account would be increasing each year due to the assumed interest earnings. For certain types of concerns, like hydro-electric companies, that actually build up a sinking fund or buy in their own bonds each year, such a method is often quite satisfactory but, in general, it is needlessly cumbersome for the average manufacturing concern, and hence is seldom employed.

While it is usually not necessary to make any distinction among the depreciation charges calculated on different groups of fixed assets in so far as the controlling and detailed expense accounts are concerned, it is ordinarily desirable to make the distinction in respect to the reserve for depreciation which serves to record the credit side of the transaction. It must not be forgotten that it is only by combining the reserve accounts for depreciation with the assets accounts for the class of assets in question that the present net value of the assets concerned may be ascertained. Hence, there should be reserve accounts for depreciation for each group of assets such as: buildings, furniture and fixtures, machinery, etc. There are sometimes certain exceptions, always one, in fact, for land does not depreciate at least, in the sense in which the expression has been employed here. In certain cases, also, tools have no reserve for depreciation account but are handled in a somewhat different way as is explained in the following article.

The controlling fixed asset accounts and their supplementary reserve for depreciation accounts need to be supported by subsidiary records or accounts as in the case of all controlling accounts. The subsidiary record usually takes the form of a plant register or equipment record. Either cards or a looseleaf book may be used as is most convenient. An excellent illustration of this kind of record is shown in Fig. 38. At the left is shown a space for recording the first cost of the equipment and at the right is a column in which additions and improvements may be entered. The sum of the two items for all the cards of a certain class of equipment should agree with the balance shown in the controlling inventory account for that same class. The record of the yearly depreciation is to be made in a column still further to the right, and the total of the column for all cards of a given group should be in accord with the reserve for depreciation account for the same group. On the reverse of the sheet are spaces for a record of the more extensive repairs which may be made from time to time. This record does not concern us here, but it will be found to be most useful when it becomes necessary to schedule or budget expenses in advance, a subject that is discussed in a later chapter.

Insurance does not present so many problems as depreciation. As was noted in an earlier paragraph, it is not necessary to estimate it in order to ascertain its amount. The insurance companies charge their premiums at a certain rate per year per thousand dollars of assets insured, and from this information it is very easy to calculate the amount chargeable to each department monthly. Ordinarily property insurance premiums are paid in advance for a year at a time in the case of industrial concerns. Hence, it becomes necessary to set up what is commonly called a prepaid insurance account to which the insurance premiums are charged as soon as they are paid, and which is credited in turn each month as the premiums are earned and charged to the proper expense accounts.

FIXED CHARGES SUMMARY SHEET

DEPRECIATION					INSURANCE				TAXES			
DEPT	BLDGS.	MCHY.	F. & F.	TOTAL	BLDGS.	MCHY.	F. & F.	TOTAL	BLDGS.	MCHY.	F. & F.	TOTAL
					ADMINISTRATION EXPENSE							
										Grand Total		
					SELLING EXPENSE							
										Grand Total		
					AUXILIARY MANUFACTURING EXPENSE							
										Grand Total		
					DIRECT MANUFACTURING EXPENSE							
Totals										Grand Total		

FIG. 40—FIXED CHARGES SUMMARY SHEET

The Handling of Taxes

In some cases taxes are almost as easy charges to handle as are insurance premiums, and in other cases estimates must be employed. If the tax rate is definitely known in advance, then the amount to be charged each month can be determined as is done for insurance premiums. If, however, the tax rate is not known till the end of the year then it is necessary to estimate it on the basis of previous experience. In most cases property taxes are not payable till the end of the year. Hence, it becomes necessary to set up a reserve for

taxes account to which shall be credited each month the amount of the estimated taxes for that month. When the taxes are paid the account should then be debited and any balance which results from a discrepancy between the actual and estimated taxes should be closed into the surplus account.

We are now ready to turn our attention to the mechanism necessary to obtain the proper amounts to charge to the controlling and detailed expense accounts and credit to the corresponding reserve for depreciation, prepaid insurance and reserve for taxes accounts. A simple and convenient method is illustrated in Figs. 39 and 40. One or more of the forms shown in Fig. 39 should be made up for each department. The information is obtained from the plant register directly, for depreciation or by calculation from the data given there in the case of insurance and taxes. Each unit of equipment is listed separately as in indicated. The totals of the several columns for each group of equipment give the information which is summarized on the form shown in Fig. 40 for the preparation of the general journal entries. The grand total of all the columns for all classes of assets is the amount to be debited each month to fixed charges account of the proper department, for the sheet should, of course, be prepared on a monthly basis.

The Fixed Charges Summary Sheet

The form shown in Fig. 40 is a summary sheet on which are accumulated the department totals according to the groups of departments and the kinds of charges. The totals of several different classes of depreciation, insurance and taxes are the credits to the accounts indicated, while the expense classification totals are the debits to the controlling expense accounts. It is possible in this way to get one general journal entry to record all the fixed charges which are to be posted to the ledger accounts as indicated below.

Administrative expense
Selling expense
Auxiliary manufacturing expense
Direct manufacturing expense
  Reserve for the depreciation of buildings
  Reserve for the depreciation of machinery
  Reserve for the depreciation of furniture and fixtures
  Prepaid insurance
  Reserve for property taxes

If, at any time, it is desired to ascertain any of the details of the entry the information can be obtained directly from the above-described sheets so that no long explanation need accompany the entry in the journal.

The accounts to be credited with these fixed charges appear substantially as follows:

Reserve for Depreciation of Machinery Account

General journal (with amount of depreciation on credit to this account on machinery which has been sold, destroyed or for some other reason removed from record in the machinery account. Credit therefor to profit and loss account).	General journal (the amount of depreciation to be recorded for this period on all machinery. Debit therefor to various expense accounts).

There is a credit balance to this account representing the amount of reserve for depreciation accumulated against machinery recorded in the machinery account.

The other reserve for depreciation accounts are handled in the same way and so it is unnecessary to show them here. The prepaid insurance account appears as follows:

Prepaid Insurance Account

Voucher register (amount of premium paid for all kinds of property insurance. Credit therefor to accounts payable controlling account).	General Journal (amount of the property insurance earned during the month. Debit therefor to various expense accounts).

There is a debit balance in this account all of the time which in most cases represents the value of the unexpired property insurance.

The reserve for taxes accounts usually has the following entries:

Reserve for Taxes Account

Voucher register (amount of the property taxes paid. Debit therefor to accounts payable controlling account).	General journal (amount of the accrued property taxes—actual or estimated —for the month in question. Debit therefor to various expense accounts).

There is usually a credit balance to this account for taxes are usually paid in arrears as was noted above. Any discrepancy because of differences between estimated and actual taxes should be closed by a general journal entry into the surplus account or profit and loss account.

The above-described methods of handling the various fixed charges are simple and accurate enough for all practical purposes. Fixed charges are important to the manager because of their fixity and the necessity that they be met in dull times as well as good.

Thermal Stresses in Steel Car Wheels

An investigation of stresses induced in steel car wheels from heating the tread has been carried out at the Bureau of Standards in a manner approximating severe service conditions. It is said by experienced railway men that the tread of the wheel becomes heated to a dull red from the application of brake shoes on descending long mountainous grades. A large number of rolled, forged and cast steel wheels both new and worn were tested. In the tests the wheels were mounted on a hollow water-cooled axle and the treads were heated by passing an electric current through a soft steel resistor which encircled the wheels.

Observations were made every ten minutes during the test of the temperatures and deformations throughout the wheel. In the regular tests the maximum tread temperature reached 716 deg. F. in 90 minutes, and in three special tests the tread was heated to about 500 deg. C. in 150 minutes. Although the test was more severe than actual service conditions, none of the wheels developed cracked plates in any of the tests.

The results of the investigation show the manufacturers how the wheels are deformed from high tread temperature, giving the magnitude and distribution of stresses throughout the wheels. The manufacturers will be able to use these new data to advantage in considering the question of proposed changes of design and manufacturing practice.

They are contained in Technological Paper No 235 of the Bureau of Standards, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Cylinder Inspection Gages

BY FRANK C. HUDSON

Methods used by two leading automobile builders for insuring accuracy in cylinder production—Sight and feel gages popular in this work

THE INSPECTION of automobile motor-cylinders varies considerably with the type of motor and, consequently, requires modified designs of inspection gages in the different shops. All gages for this purpose, however, afford suggestions for adaptation to use in other lines, and are consequently of general interest. The gages illustrated herewith are from the shops of the Pierce-Arrow Motor Car Co., Buffalo, N. Y., and the Peerless Motor Car Co., Cleveland, Ohio.

The gage in Fig. 1 is used in inspecting the finish milling operation of the Pierce-Arrow cylinder block. The bar *A*, which has the sides milled out to form a

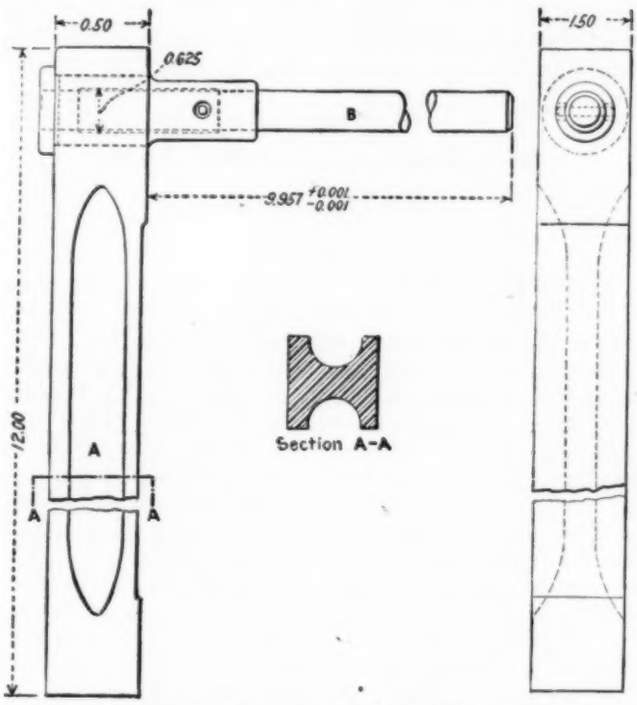


FIG. 1—GAGE FOR HEIGHT OF CYLINDER BLOCK

channel, both for lightness and to make it easier to handle, rests on the top of the cylinder block, while the rod *B* tests the height, or distance between the two faces of the cylinder block. Only the main dimensions are given, as it is necessary to vary most of the proportions in adapting this gage to other cylinder blocks.

The gage shown in Fig. 2 is also from the Pierce-Arrow shop, and is for gaging the thickness of the head of the combustion chamber. The 6-in. block *A* rests on two of the bolt bosses, one of which is shown at *B*. These bosses are machined and the face *C* is afterward milled with relation to them. This gives a basis for measurement, as the combustion chamber *B* is milled to a definite distance from the face *C*, so that the thickness of the head is easily gaged by the arm *E* which is inserted through a core hole in the water jacket and the thickness read at the end of the pointer *F*. The end *E* and the pointer *F* are hardened. The pointer rests on the central line when the arm *E* is at the proper distance from the top of the bolt hole boss.

A sight gage for the profile of the combustion chamber in the cylinder head is shown in Fig. 3. This gage is made of ¼-in. steel having the profiles cut as shown and to the tolerances given. The drawing also shows the method used in the Pierce-Arrow shop for stating tolerances. The plus tolerance is above the line and the minus tolerance below. The gage is located by the two studs shown at *A* and *B*.

The gages shown in Figs. 4, 5 and 6 are from the

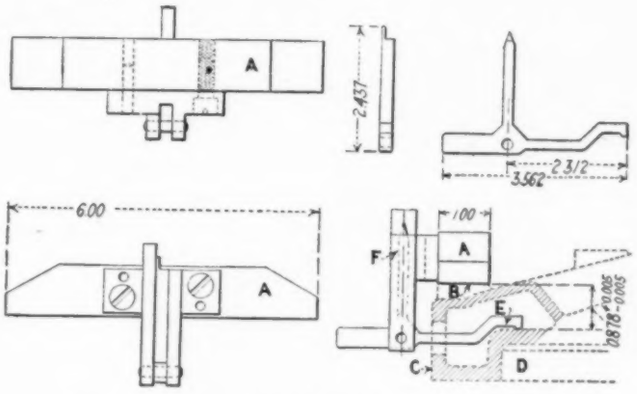


FIG. 2—GAGING THICKNESS OF COMBUSTION-CHAMBER HEAD

Peerless Motor Car Co. The method of gaging the distance from the valve seat to the face of the cylinder block is shown in Fig. 4. As will be noted, the valves are on an angle of 9¼ deg., the end of the gage rod being faced to this angle so as to seat on the surface plate on which the cylinder is inspected. The dimensions are given solely to show the important points to be gaged, and not for exact figures.

The gage for measuring the depth of the cylinder from the face to the top of the combustion chamber is shown in Fig. 5. Here the top or plate *A* fits the cylinder bore and also rests on the cylinder face, so as to insure the gage being parallel with the bore. The rod *B* goes through the cylinder bore and bears against the top of the combustion chamber. The gaging is done by the stud *C*, which is fitted into the bar *B* after being

hardened and ground. The tolerance is determined by the movement of the stud *C* in the slot in block *D*, the amount of which can be varied to suit any desired condition.

The cylinder gage shown in Fig. 6 is used for testing the squareness of the bore with the face of the cylinder block. This gage consists of a crosshead or facing strip *A* which, as shown at *B*, is 27 in. long. Toward one end, it is bored to receive the bar *C*, which extends down into the cylinder and carries two sets of gaging fingers, as shown at *D*. Every finger has a flat spring which tends to keep it toward the center of the bar. Each set of these fingers is controlled by a cone, as at *E* and *F*, operated by a right- and left-hand screw by the knob *G*.

With the gage inserted in the cylinder bore, the fingers are expanded until they make contact with the cylinder wall. If the bore is square with the face of the cylinder block, the measuring end of the crosshead will remain in contact with the face as the gage is turned in different positions.

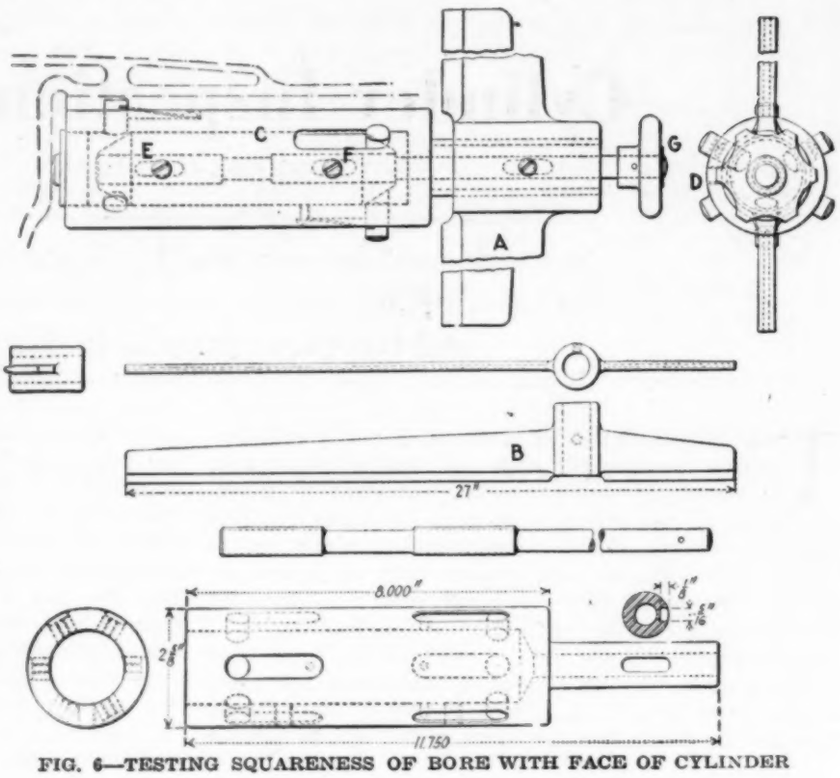


FIG. 6—TESTING SQUARENESS OF BORE WITH FACE OF CYLINDER

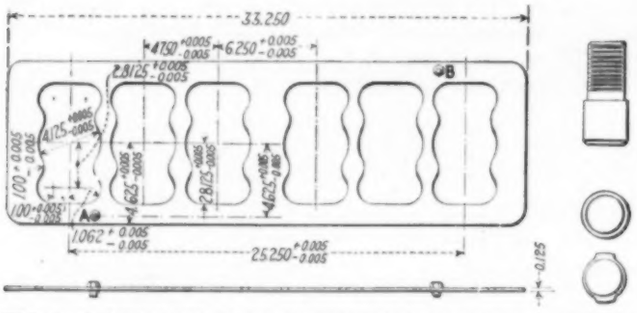


FIG. 3—SIGHT GAGE FOR COMBUSTION CHAMBER OUTLINE

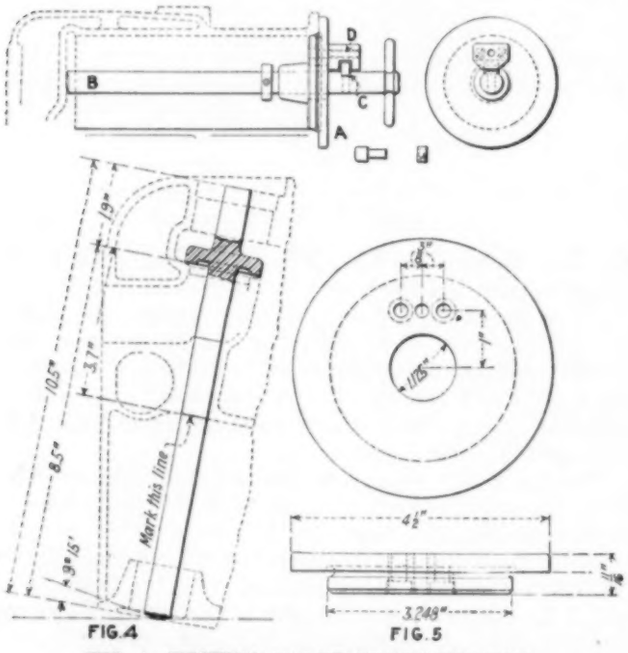


FIG. 4 FIG. 5

FIG. 4—TESTING VALVE SEAT LOCATION
FIG. 5—GAGING CYLINDER DEPTH

If the bore is not square, the error can be accurately detected on account of the long length of the crosshead.

Standardization of Purchase Specifications

BY P. G. AGNEW

Hundreds of millions of dollars could be saved by municipal and state governments and by the industries of the United States through the unification and standardization of purchase specifications. The purchasing agents of state and municipal government departments are spending approximately $700,000,000 yearly for supplies, materials of construction and other products, but these purchases are for the most part unco-ordinated. In many cities and states perhaps half a dozen different departments may be buying the same materials at the same time but at different prices and under different specifications, or with no specifications whatever. Such a condition is, of course, conducive to great waste. However this apparent waste in purchasing is not confined to the various government departments alone.

Industry's purchases are even greater than those of the state and municipal governments combined. It has been estimated that the industries represented in the National Association of Purchasing Agents alone spend more than a billion dollars a year for materials and supplies. Although the waste resulting from unco-ordinated purchases is undoubtedly much smaller in industry than among local and state departments, it is certain that in industry, also, hundreds of millions of dollars could be saved by national standardization of purchase specifications, of methods for analysis of materials, and of sizes, types, and styles.

*Abstract of address delivered at the annual meeting of the National Association of Purchasing Agents, at Cleveland, Ohio, May 16.

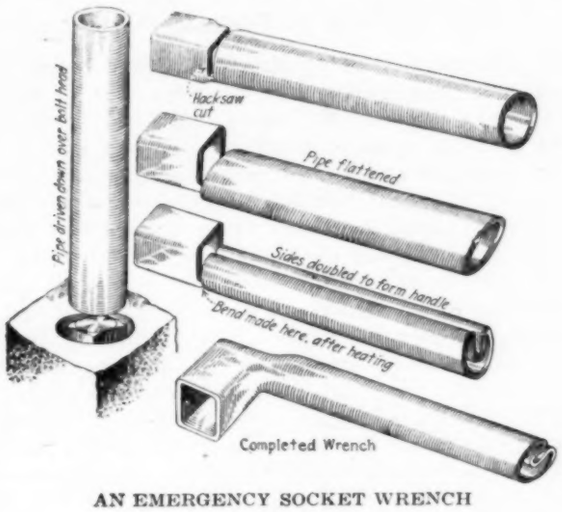
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Making a Socket Wrench to Meet an Emergency

BY GEORGE A. LUERS

Frequently the small shop is called upon to furnish a wrench for some special purpose in a hurry. The owner of a tractor required a wrench to handle a square head bolt set down in the frame of the machine and being unable to obtain a stock size at any hardware



AN EMERGENCY SOCKET WRENCH

store, appealed to the owner of a repair shop in southern Maryland for a suitable tool.

The sketch illustrates the method adopted to supply this tool, with the least delay and is worth noting, in that the wrench was made without forging or machining and from a short length of seamless steel pipe, obtained from the scrap pile. To make this wrench the end of the pipe was heated and driven over the bolt head. Next the pipe was sawed about three-fourths across with a hacksaw. The end was then flattened and bent double. It was heated before making the sharp bend at the junction of the handle and socket, to avoid breaking. While the wrench was hurriedly made, the result was a most satisfactory tool.

Spacing Small Holes Accurately

BY G. W. NUSBAUM

Many mechanics seem to have difficulty in spacing small drilled holes where accuracy with relation to each other or from given points must be maintained, as in making jigs, dies and fixtures. There are various ways of securing this accuracy, and the methods should be fully understood by all machinists.

One method, which is very simple, is as follows: Referring to Fig. 1, let us assume that we want to drill two holes in piece *A*, which is to be used as a jig. In a piece of cold-rolled steel or flat ground stock, *B*, a hole of the desired size is drilled. A parallel *C* and the piece *B* are then clamped to *A* in such a manner that the edge of piece *B* will be flush with and parallel to the edge of *A*, and so located that a piece of cigarette paper will just draw from between the end

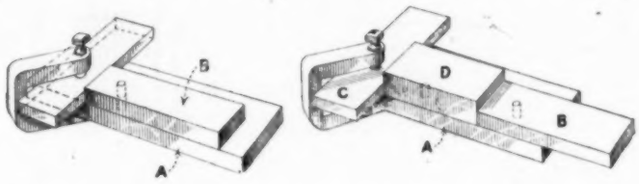


FIG. 1—SPACING SMALL HOLES WITH ACCURACY

of piece *B* and the parallel. The first hole is then drilled in the jig through the hole in piece *B*.

Suppose the distance between the centers of the two holes is required to be exactly 2 in. We now loosen the clamp on *B* and slide the piece along, keeping it flush and parallel with *A* until the 2-in. measuring block *D* will lie between it and the parallel and the paper draw as before. The piece is clamped and the second hole in the jig can then be drilled with every assurance that it will be the right distance from the first one.

The second method requires flanged collars, but once these are made and hardened, they will constitute a very valuable addition to the toolmaker's kit. Fig. 2 shows this method, with one of the flanged collars clamped in place on the job to be drilled.

The first hole is drilled and a pin is neatly inserted. The collar is now lightly clamped in the approximate

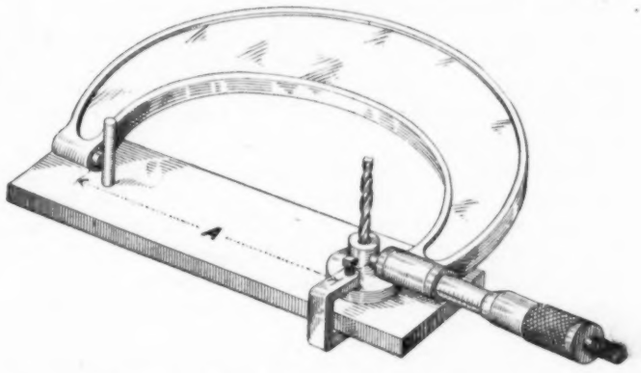


FIG. 2—THE FLANGED COLLAR METHOD

position of the second hole. To the desired center distance between the holes is added one-half of the diameter of the pin and one-half the diameter of the collar, which gives the dimension *A* to which the collar must be set. The setting can be made very accurately by means of a micrometer, and after finally locating the collar, it is clamped firmly for drilling the hole.

Threading an Aluminum Phone Case for Radio Apparatus

By H. E. Crawford

The method used by the Kilbourne & Clarke Mfg. Co., Seattle, Wash., in threading the cups or shells used in head phones for radio work, shows the handiwork of a thoroughly practical man. This company builds an unusually complete line of radio apparatus and has a shop that will compare favorably with the majority of similar shops in any part of the country.

The problem was to thread the outside of the case to match the outer piece, or cover which is of molded

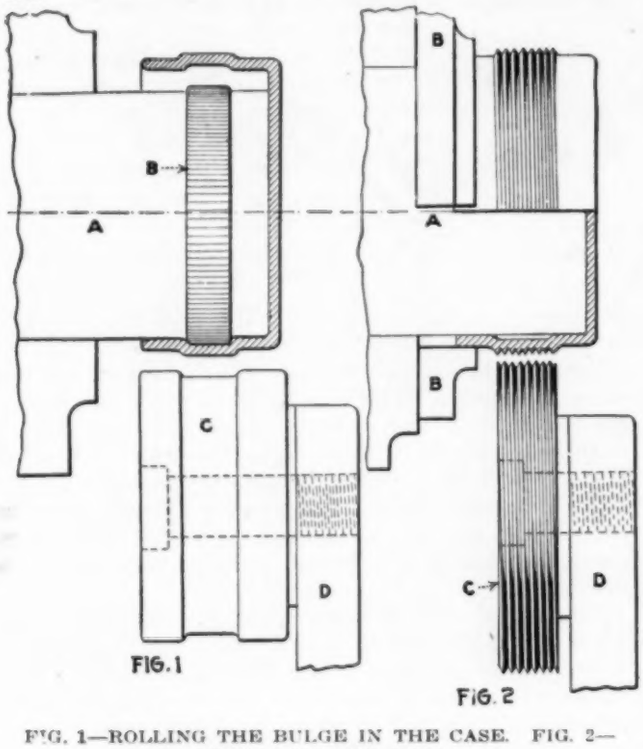


FIG. 1—ROLLING THE BULGE IN THE CASE. FIG. 2—THREADING THE CASE

bakelite or similar material. This required that a portion of the case be raised for the thread, which is rolled instead of being cut. As the aluminum of which the case is made is 0.090 in. thick, it is too heavy for bulging by ordinary means so it is bulged by rolling as shown in Fig. 1.

The mandrel *A*, enough smaller than the inside of the case to allow it to be easily removed after bulging, is held in a lathe chuck as shown. The mandrel has a raised portion *B*, over which the case is rolled to form the bulge. It was found that the collar on the mandrel must be knurled to drive the case satisfactorily during the rolling.

The case is slipped over the mandrel as shown and the roll *C*, mounted on the shank *D*, which is held in the tool post, is pressed against the outer part of the shell, producing the desired bulge in short order.

Rolling the thread was accomplished by the method shown in Fig. 2. It will be noted that the mandrel *A* fits the inside of the case in this operation and also that the chuck has auxiliary jaws *B* which grip the end of the case or shell and hold it firmly against the mandrel *A*. This was found necessary to overcome the tendency of the shell to open out, or flare, under the action of the roll. The auxiliary jaws practically encircle the end of the shell so as to press it firmly against the mandrel *A* and prevent the flaring of the shell referred to.

The making of the threading roll is easy after one understands the principle. But unless the roll is the same diameter as the blank, the results are not satisfactory. A threading roll half the diameter of the work gives a double thread and, in a like manner, other variations produce unexpected results at times. The exact amount to allow on the diameter of the case for the flow of metal to fill the thread is not easy to calculate the first time, but the shop superintendent, F. H. Harp, credits the *American Machinists'* Handbook with making the job easy to accomplish after he really got to work on it.

Drawback Chuck Operated by a Push Rod

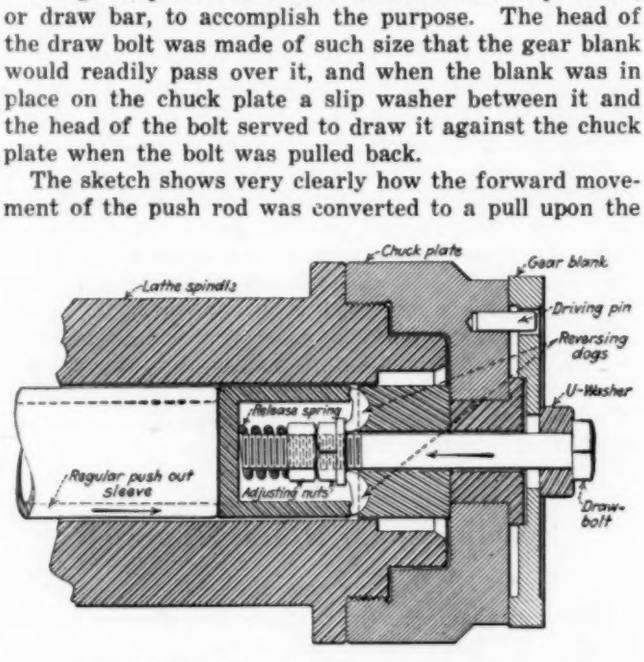
By A. W. Freeman

The job was that of turning, facing and boring some small spur gear blanks, and the work was to be done in a No. 4 Warner & Swasey universal turret-lathe fitted with the usual push collets.

Two settings were, of course, necessary, one side being faced, the shaft hole bored and a recess formed by which the finished gear was to be located on a flanged shaft. After turning the blank over, the other side was faced and the outside diameter turned. As it was of prime importance that the sides be parallel and that the outside diameter be concentric with the locating recess, we desired some means of drawing the work firmly against the chuck plate of the second setting.

The accompanying sketch shows how we converted the regular push rod of the machine into a pull rod, or draw bar, to accomplish the purpose. The head of the draw bolt was made of such size that the gear blank would readily pass over it, and when the blank was in place on the chuck plate a slip washer between it and the head of the bolt served to draw it against the chuck plate when the bolt was pulled back.

The sketch shows very clearly how the forward movement of the push rod was converted to a pull upon the



DRAWBACK CHUCK OPERATED BY A PUSH ROD

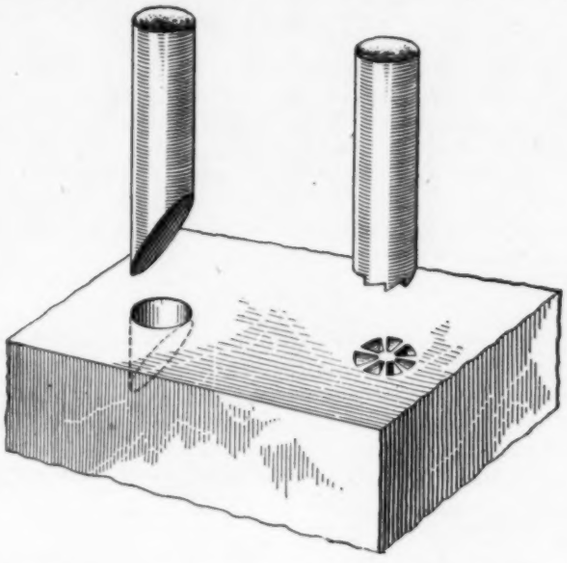
draw bolt by means of the little semicircular reversing dogs, which were made to rock in their seats and thus act as levers of the first class. The whole mechanism was held in the spindle of the machine by the chuck plate, which screwed on the spindle nose.

Making and Hardening Small Reamers

By Amos Ferber

Toolmakers often have occasion to use small reamers of odd sizes and the only way to get them is to make them on the spot. Fortunately, most tool rooms carry a stock of drill-rod in sizes from No. 60 drill-gage to ¼ in., varying by one or two thousandths in diameter.

There are several ways to make a reamer. One is to turn up a blank, square one end for a wrench and



HARDENING SMALL REAMERS IN COLD LEAD

mill flutes in the other in a milling machine provided with a dividing head. This is an expensive job and cannot be recommended when the tool is to be used but once, or possibly twice. A more common way is to bevel the business end and file three, five, or seven teeth across the beveled corner with a three-cornered file. This latter product is a "rose" reamer and can be made by any toolmaker in a few minutes.

A still more simple way is to take a piece of drill-rod about one-half thousandth below the desired size of hole and grind or file one end at an angle anywhere from 15 to 45 deg. as shown in the sketch. There is nothing in the appearance of the product to indicate to the uninitiated that it is a reamer, but for enlarging a hole by a small amount and for leaving a smooth surface therein, there is nothing better unless it be a lap.

Both a reamer of this kind (I never heard any specific designation applied to it) and the rose reamer, when made upon the end of a drill-rod, depend upon the hardening to make them effective. As the cutting ends are no larger before hardening than the rest of the rod such reamers have no clearance and unless this is supplied by the slight expansion in hardening they will bind in the hole.

The hardening must be confined to the extreme end, and to accomplish this purpose by quenching in water is difficult and the result uncertain. Either kind of reamer may be hardened quickly, satisfactorily, and almost without possibility of failure, by "quenching" the heated tool in a block of cold lead.

Take a small chunk of lead (not babbitt, it is too hard) and drive the cold reamer into it just sufficiently to cover the angular end. If it is a rose reamer, do not attempt to cover the entire depth of the teeth. Withdraw the tool and heat the extreme end to the required hardening heat, then drive it quickly into the hole in the lead.

That is all there is to it. All you have to do now is to talk to your fellow workmen or scratch your ear a couple of minutes and the tool will be ready to put to work. No tempering is needed and, ordinarily, no sharpening. Try the reamer in a piece of scrap and if it cuts too large it may be reduced a slight amount (a very slight amount) by the judicious use of an oil stone.

Of *course* you don't believe it. Neither did I, and I was foolish enough to tell the "old man" so *before* I tried it. I apologized good and plenty, later.

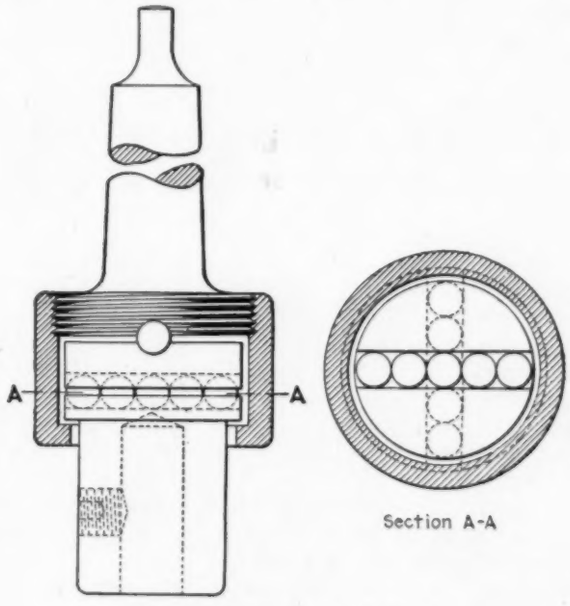
A Floating Tap-Holder

By Richard Hervig

We needed a sensitive floating tap-holder and, as I could not find any on the market, I had one made as illustrated herewith, which proved to be very satisfactory.

Across the threaded end of the shank is milled a half-round groove having a radius a trifle greater and of a total depth about $\frac{1}{32}$ in. less than that of a standard steel ball of suitable size. Across the larger end of the shouldered piece that holds the tap a similar groove is milled.

Between these two opposed parts is a disk having



A FLOATING TAP HOLDER

similar grooves milled across opposite faces at right angles to each other. A sleeve to screw on the threaded end of the shank serves to hold all parts together, but is sufficiently larger in inside dimensions to allow considerable latitude to the other members.

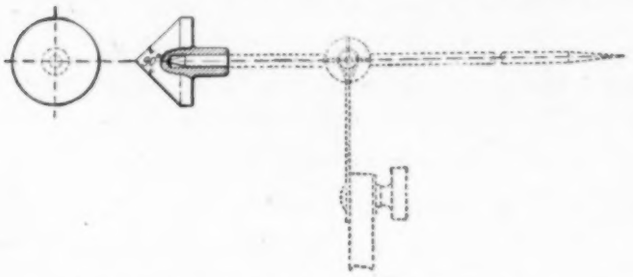
A sufficient number of standard steel balls to fill the grooves is put in place and the sleeve screwed tightly on the shank. The shoulder on the lower member prevents the parts from separating enough to allow the balls to get out of the grooves.

Center Indicator Attachment

By G. W. Nusbaum

A center indicator such as is described in almost any catalog of machinist's tools, is a very valuable tool when that portion of the work which is to be centrally located in the lathe is solid, so that a prick-punch mark may be made therein for holding the point of the short arm of the needle.

If, however, a hole is already drilled in the center of



ATTACHMENT FOR CENTER INDICATOR

the work which you desire to relocate centrally on the face plate, much difficulty is experienced with the ordinary center indicator.

In order to overcome this trouble a conically shaped button should be made similar to the illustration. It will be noted that the button is bored centrally with the conical surface and is slipped on the short arm of the needle of the indicator, as shown in the illustration. Various size buttons may be made so that a wide range of holes can be accommodated. On account of the conical shape, each button will cover holes of various sizes.

Valve Grinding—Continuous or Reciprocating—Discussion

By Wm. R. Seddon

On page 528, Vol. 58, of the *American Machinist*, Richard H. Kiddle says that valve grinding is very often overdone. This is very true and I believe the method we use in grinding valves will be of value. The face of the valve is first ground on a Franklin grinding machine to the proper angle, which in most cases is 45 deg. Then we examine the seats very carefully and if necessary true them up with a valve reseater, but great care must be taken not to cut the seat down any more than necessary, for deep cutting would soon mean a new block of cylinders. The slower you turn the cutter the better the results.

In grinding the valve in, it is turned back and forth ten or fifteen times. Never make a complete revolution when grinding in a valve as it makes ridges in the seat. Wash the valve and seat with kerosene, wipe dry and apply prussian blue or red lead on the valve face. Then bring the face of the valve in contact with the seat, as you would when grinding, and turn back and forth once.

Take the valve out again and wipe the blue from the seat, allowing the blue to remain on valve face. Now let the valve face come in contact with seat and again turn back and forth. If the blue shows all around the seat, the seat is perfect but if the blue only shows in spots on the seat, it is necessary to keep on grinding and to continue the above operations until the blue shows all around the seat.

It must be remembered that compression is the backbone of any gasoline motor, and seven-tenths of the motor troubles today, for which a great many people blame carburetor and ignition, are due to faulty compression.

Helping Men Become Familiar with Machines

By I. B. Rich

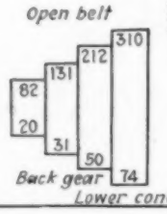
The southern branch of the University of California is located at Los Angeles, and has had quite a quota of ex-service men as students in shop work. In order to make it easy for them to learn the right speeds and feeds for various machines, the speeds obtained by running the belt on certain cones, are stamped on the cone itself as in the sketch at the bottom of the chart shown. In the case of back geared machines, the speeds both with and without gears are given.

In other cases a table is made, as shown herewith, this being for a Sibley 24 in. upright drilling machine. The table is for cast-iron work. It begins with a $\frac{3}{8}$-in. drill and shows that its surface speed will be 30.5 ft. per min. with the belt on the larger driving cone which gives 310 r.p.m. It also shows that this cone will give a speed of 38.9 r.p.m. to a $\frac{1}{2}$-in. drill, which is above the

DRILL SPEED TABLE FOR WORK IN CAST IRON

Feed Pin	F P M.	Size of Drill	R P M.
	30.5	3/8	310
	38.9	1/2	
	31.2	9/16	
0.00645	34.7	5/8	212
	38.2	11/16	
	25.6	3/4	
	27.2	13/16	
0.00952	28.1	7/8	
	31.2	15/16	
	34.1	1	131
	36.0	1 1/16	
	38.3	1 1/8	
0.01419	25.0	1 3/16	
	26.9	1 1/4	
	28.1	1 5/16	
	29.5	1 3/8	
	30.9	1 7/16	82
	32.1	1 1/2	
0.01975	33.5	1 9/16	
	34.9	1 5/8	
	35.8	1 7/8	
	37.6	1 15/16	74
	26.1	2	50
	30.0	2 1/8	

Open belt



36 F P M. Limit for cast iron
30 F P M. Limit for soft steel
25 F P M. Limit for tool steel

FEED AND SPEED CHART FOR DRILLING

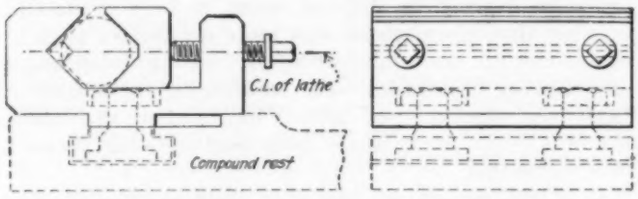
36 ft. allowable according to the note below, so the belt must go down on the next smaller cone.

Reading the chart another way, it shows for example that the belt on smallest cone and the back gears out, gives suitable speeds for cast iron, for drills from $1\frac{7}{16}$ to $1\frac{5}{8}$ in. The chart also shows the feeds obtained with different positions of the feed pin. It has been found very useful in helping new men become familiar with the machine.

Device for Holding Boring Bars and Drills in Lathe

By R. W. Barrett

The boring tool and drill holder shown in the accompanying sketch possesses the following advantages: It will hold any bar or drill, within its capacity, true to the center line of the lathe; it does not obstruct the workman's view of the hole being bored; its range is



HOLDER FOR BORING BARS AND DRILLS

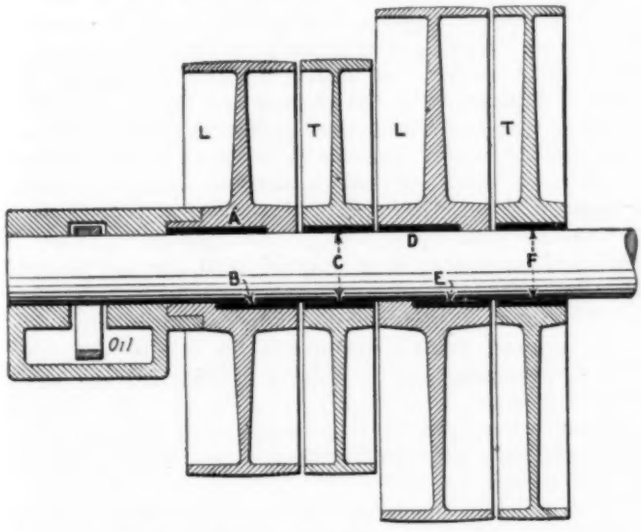
so great and a change from one size of bar or drill to another is so easily and quickly made that on a majority of chucking jobs the fixture may remain in place until the work is completed, merely changing the bars or tools to suit the work of boring, facing or turning.

The rib on the bottom should be made to fit the slot in the toolblock of the compound rest, and I find it advantageous to have this rib at an angle of 15 deg., swinging the rest over to correspond. The compound rest thus remains in the position required for threading operations.

A Neat Wiper System for Oiling Loose Pulleys

By Frank C. Hudson

Methods of oiling loose pulleys are always open to discussion. Here is a method worked out by Wilfred Heuser, of Salt Lake City, Utah, and which has been



OILING LOOSE PULLEYS IN TANDEM

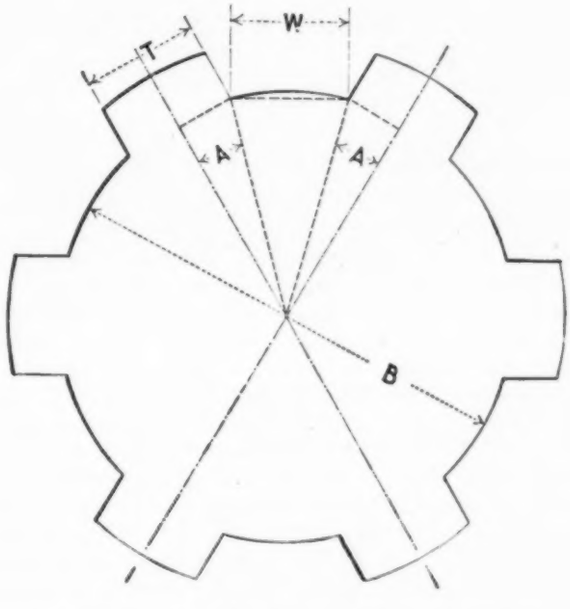
in use in his shop for several years. The sketch only shows part of the pulleys on his countershaft but they are all lubricated from oil reservoirs in the bearings at the ends of the shaft. The reservoirs are equipped with ring oilers as shown which bring the oil up to the shaft. From there the oil works its way along the shaft and is picked up by the felt wiper *A*, which does not extend the whole length of the hub in the loose pulley *L*. As the oil is fed to the shaft, from wiper *A*, wiper *B* on the other side picks it up and not only oils the rest of the bearing in the loose pulley hub, but passes the oil to the two wipers *C* in the tight pulley *T*.

The oil works its way through these wipers, which extend clear through the hub in the case of tight pulleys, and is fed to the wipers *D* in the next loose pulley hub, from there to wiper *E* and on the wipers *F* in the tight pulley at the right. It might seem that this is a long way for the oil to feed, but the answer is that it has been doing it so successfully that the pulleys never give trouble, and only require oil in the reservoir at long intervals. It will be noted that the end of the bearing box has been bored out to receive the turned down end of the first loose pulley, thus preventing leakage, as the first wiper absorbs the oil before it has a chance to run out. The oil spreads to the left, also, where a similar set of wipers lubricates the bearings in the pulleys located there.

Formula for Finding Root Width of Splineways

By Clarence D. Scrom

The following formula will be found useful for cal-



CALCULATING ROOT WIDTH OF SPLINEWAYS

culating the root width of splineways on splined shafts:

$$\sin\left(\frac{360^\circ}{N} - 2A\right) \times B = W$$

in which N = number of splines and B = diameter of shaft at the root of the splineway.

Angle A must first be computed as follows:

$$\sin A = \frac{T}{2} \div \frac{B}{2}, \text{ or } \sin A = \frac{T}{B}.$$

in which T = width of spline and B = diameter of shaft at root of splineway.

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Give the Shop Man A Visit Through the Shop

CARL DIETZ, president of the Bridgeport Brass Company, told the United States Chamber of Commerce at its recent meeting about some of his methods of acquainting his employees with the company's business.

One thing he did was to take his office people through the shop to let them see the materials and come in contact with the processes about which they are continually talking and writing.

An unexpected development was this request of a shop man: "When are *we* going to be taken through the shop?" It looks as though that one tip is worth enough to pay Mr. Dietz for the trouble and expense of the office people's trip. The shop man is entitled to a trip through the shop. He will be the more conscientious worker for knowing just why he does his operation and will feel that he is helping to build a whole rather than merely working on a part. Shop trips for shop men should be good counter-irritants to the old familiar "unrest."

Need for Standard Names Of Machine Parts

NO MATTER where one goes the need of a standard nomenclature for machines and their elements, is everywhere apparent. The more isolated the district the greater the delay, annoyance and cost of not knowing what the other fellow means by the name he gives a certain kind of bolt, or screw, or part of a machine.

One concern has been forced to sketch every part wanted and describe it in as much detail as seems necessary. This has been brought about by costly delays and expense in having the wrong part sent for what seemed to be a simple part, simply named.

There is also a remnant of the old confusion as to the threads of a half inch bolt in some parts of the country. A recent complaint in the middle west states that both twelve and thirteen threads to the inch are still supplied by some large bolt makers and that you are apt to get one or the other unless you specify which is desired.

This lack of standardization adds to the cost of doing business and makes it unnecessarily difficult for supply parts to be secured promptly. Individuality has its place, but the automotive industry has shown us the way toward the advantages of standardized elements used in construction.

Using the Proper Machine in the Right Place

THERE was a time when the lathe and the cylindrical grinder competed with one another. The man selling the one machine tried to convince his prospective customer that the other machine was less productive, or if he did not want to be considered a knocker that his machine was more productive than his competitor's. Any number of discussions took place; any number of articles were written on the subject of "grinding machine vs. lathe" or "planer vs. milling machine." In many cases both parties were right, in others, neither.

It is well recognized now that there is no such thing as "lathe vs. grinding machine," but that each machine has its legitimate scope and no lathe maker who knows his business tries to sell a lathe where a grinder is needed; at least not if he is acquainted with the facts of the case. Machines of different types do not compete, they supplement each other.

And yet, even now, it is not considered good form to point out in public that this machine is better than that for such and such an operation on a certain piece. Such a statement, however well supported by facts and reasons, would be considered a knock of the machine which happens to get the worst of the argument.

This is not a proper view to take of the matter. A clean cut and frank discussion on the applicability of various types of machines to different jobs would not harm any machine. It would more clearly establish its proper place in industry, it would tend to eliminate the use of machines in places where they do not belong and as a result both competing machines, if we may use the term this time, would finally gain in appreciation by the user. There would be less occassion to condemn either of the two machines because they are used in places where they have no right to be.

It would be interesting to hear about the experiences of shop men who have changed over from the planer to the milling machine or vice versa and to hear of the results obtained from the change and the reason why; to hear from them why they prefer the shaper in one case and the milling machine in another; when a milling machine is more or less productive than a surface grinder.

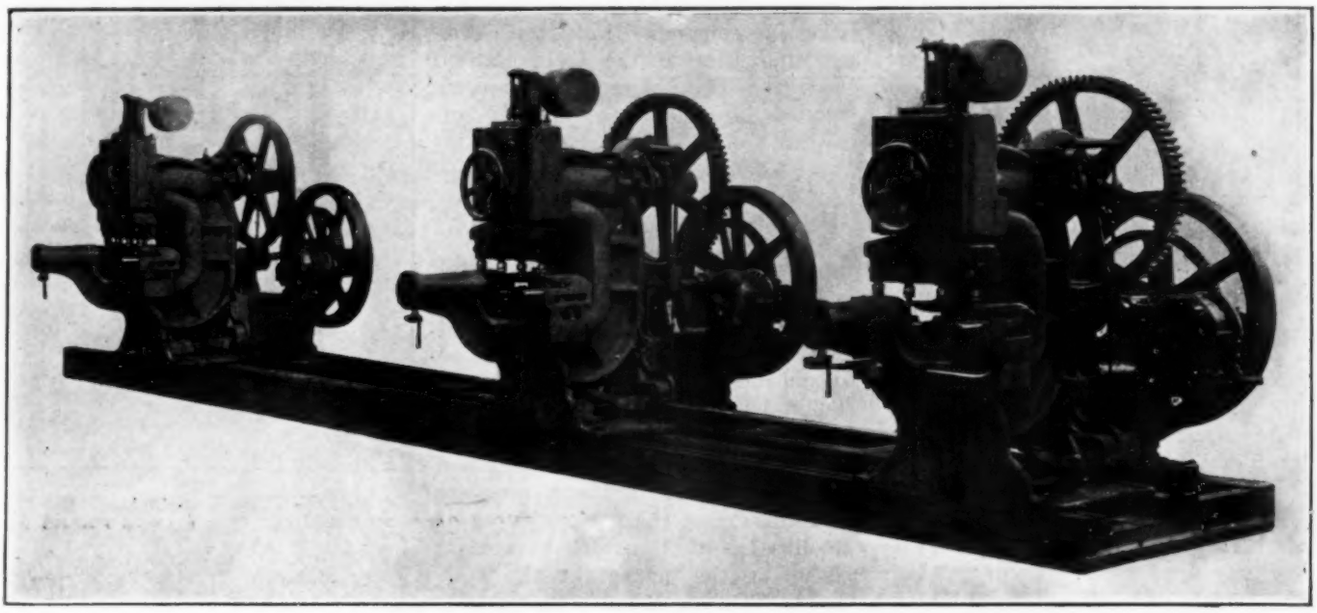
The fact that in one shop one kind of machine is used and in another shop another kind and for practically the same kind of work cannot always be explained by the fact that the machine happened to be there and must be used. Often preference for one or the other type is expressed and it is quite difficult for the salesman of a certain type machine to make an impression in one shop whereas he may be welcomed in another where the same class of work is being done. What seems to be the reason?

Is it the lack of understanding or is there really a difference in certain conditions which makes it advisable to use different classes of machines in different shops in order to obtain the most productive method?

Shop Equipment News

Cleveland Group Mounting for Punch Presses

For punching steel angles used in the construction of oil derricks and towers such as radio towers or those supporting water or storage tanks, and for punching roof trusses, all of which as a rule have groups of holes at each end and at the center, the Cleveland Punch & Shear Works Co., Cleveland, Ohio, has recently developed and placed on the market the combination group mounting of punch presses shown in the illustration herewith.



CLEVELAND GROUP MOUNTING FOR PUNCH PRESSES

Angles may be punched in either leg without the necessity of turning the angles end to end. To hold the angles firmly against the gage blocks in a straightened condition, air cylinders are used. Supports are also provided for the angles. The gage blocks are adjustable to permit the punching of various sizes of angles or sections. An end gage is also furnished for positioning the work.

The machines punch angles 26 ft. in length or less. One end machine is stationary, while the other two machines are adjustable along the base by hand. Each individual machine has punch attachments which are adjustable to permit a minimum distance of 2 in., and a maximum distance of 20 in. between them. The machines may be operated individually by the treadles or all three may be operated simultaneously from either end. Each air cylinder may be operated individually also, or all may be operated simultaneously from the stationary end.

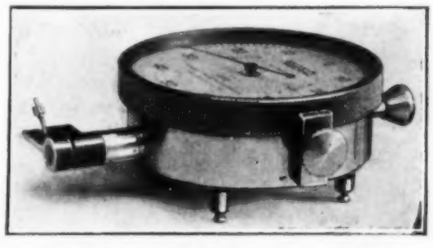
The style C machines illustrated have a capacity of 6 x 6 x $\frac{5}{8}$ in. as a maximum, but this mounting can be provided for machines having a greater or lesser capacity.

Federal Micrometer Indicator

The micrometer dial indicator shown herewith has been brought out by the Federal Products Corp., 15 Elbow St., Providence, R. I., for the purpose of inspecting or checking errors in size of small parts for which a micrometer caliper is ordinarily used.

The accompanying illustration shows the application of the tool. The jaws are opened by a pressure of the finger on the button at the top of the dial, and then allowed to close upon the work by the action of the indicator spring. The direction and amount of variation from standard are shown in thousandths of an inch by the position in which the pointer comes to rest above or below the zero line. The reading is adjusted to zero by turning the knurled bezel ring, which is then clamped against accidental movement by the small screw at the side.

The diameter of the dial is 2½ in., and the regular graduation is to 0.001 in. Dials with other graduations may be supplied if desired. The instrument will gage any dimension up to $\frac{5}{8}$ in. It rests ordinarily on the small legs shown.



FEDERAL MICROMETER DIAL INDICATOR

"Threadwell" Adjustable Dies and Die-Holders

The Wells Corp., successor to the Frank O. Wells Co., Greenfield, Mass., is now making the "Threadwell" adjustable screw-cutting die in a new range of sizes covering from ¼ to 1 in. in diameter, with six changes of outside dimension. These dies, one of which is shown in Fig. 1, are hexagonal in shape and are adjustable for size by means of a fillister-head screw of generous proportions, so that adjustment may be made without resort to a special

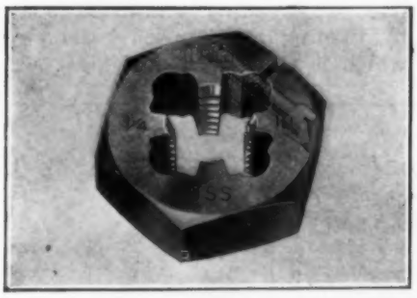


FIG. 1—"THREADWELL" ADJUSTABLE DIE

screwdriver and with little danger of damage to the slot in the head.

Aluminum stocks are provided to hold the various sizes of dies, and the hexagonal shape of the latter lends itself to the use of a socket or open-end wrench in case it is desired to use the die in restricted spaces.

For use upon the screw machine or turret lathe two forms of holders

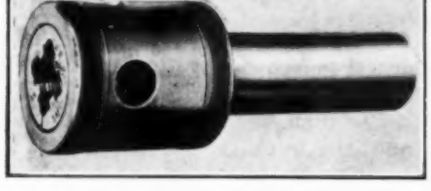


FIG. 2—RELEASING DIE-HOLDER

are made, as shown in Figs. 2 and 3, one having a shank to be fitted to the turret, while the other is designed as an adapter to go into already existing holders with which the machine may be equipped. The full length holder, Fig. 2, incorporates the releasing, or "slip-off" feature common to die-holders that are used to cut threads up to a predetermined length.

The die is held in a hexagonal pocket somewhat larger in dimensions than itself and is retained by means of the knurled ring, which screws on the holder and bears against a shoulder, thus allowing the die a considerable amount of freedom of movement to adapt itself to minor misalignment of the machine, though holding it securely against displacement. Holes in the body of the

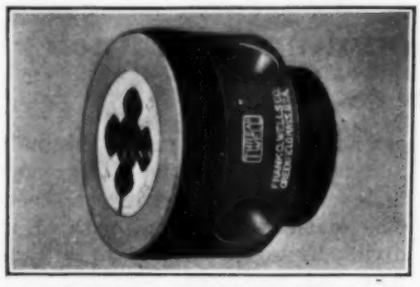


FIG. 3—ADAPTER FOR SECURING THE DIE IN HOLDERS

holder provide for a free flow of oil or cutting compound through the die, and thus prevent the accumulation of chips. The holders are made in six sizes to accommodate all sizes of the dies.

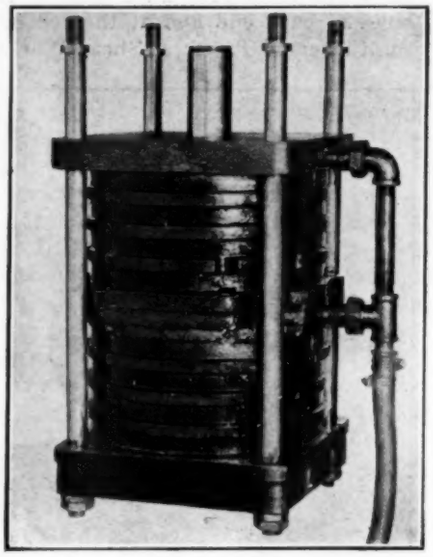
Marquette Pneumatic Die Cushions for Punch Presses

An important factor in the process of drawing parts from sheet metal is the pressure that is applied to hold the blank flat, as this pressure should be just enough to keep the metal of the shaped part smooth at all stages of the operation. A method of obtaining this uniform pressure is by means of the various types of pneumatic die cushions recently placed on the market by the Marquette Tool & Manufacturing Co., Chicago, Ill., one type of which is shown in the illustration herewith.

These cushions are claimed to produce a uniform pressure regardless of the unevenness of the blank or the thickening of the metal during the operation. They are suitable to a large variety of requirements, the size ranging from cushions having a piston 6 in. in diameter, which are suitable for machines drawing shells to a depth of 2 in., to cushions which have a piston 25 in. in diameter, which are intended for presses drawing shells to a depth of 8 in. These cushions may be applied to a press singly or in batteries.

Both single- and double-acting cushions may be furnished, with two methods of operation for each type. In one method, the piston remains stationary when the compressed air is admitted into the cylinder, while the cylinder rises vertically on a sleeve around the piston rod. As the cylinder is forced upward, pressure is applied on the drawing ring. In the other method, the cylinder remains stationary and the piston is forced vertically upward when compressed air is admitted into the cylinder. The former method is generally used singly, but it can also be applied in multiple on multiple-crank presses. The latter method with the stationary cylinders is used principally in batteries on double- or multiple-crank presses.

The cushions are connected to the presses by screwing the draw-bolt attached to the cushion into the bot-



MARQUETTE PNEUMATIC DIE CUSHION FOR PUNCH PRESS

tom surface of either the bolster or die. When only one machine is supplied from the main compressed air tank the cushion is connected directly to it; but if a number of machines are connected to the same main air tank each press has an individual air tank and regulator, so that the pressure on a certain machine may be maintained independent of the rest.

These air cushions may also be utilized in making double-acting presses serve as triple-acting, and in so doing they produce the full pressure at the start and the minimum necessary pressure at the end of the stroke. In a double-acting press another advantage of an air cushion is that it holds the blank so that it will not slip during the draw and cause an uneven flange. Air cushions are also used to make the blank holder yielding, so that it will adjust itself to unevenness in gage as well as prevent the breakage of the press.

Additions to the Heald No. 72 Internal Grinding Machine

Several features have been added to the No. 72 hydraulically operated internal grinding machine made by the Heald Machine Co., Worcester,

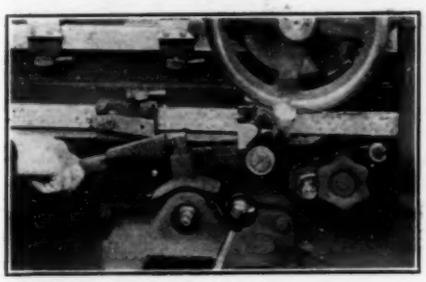


FIG. 1—MECHANISM FOR AUTOMATICALLY WITHDRAWING THE WHEEL

Mass., and described on page 311 of the *American Machinist*.

In Fig. 1 is shown the mechanism by means of which the operator may run the wheel slide out of the way for the purpose of gaging the work. To do this he merely lifts the hand lever at the left, thereby causing the latch of the forward reversing dog to ride over the top of the reversing lever, which can be seen inclined slightly to the left, and allowing the slide to continue its rearward movement without reversing and at the rate of travel for which the control valve is set.

When the tapered end of the bar which is attached to the forward reversing dog reaches the small roller shown at the right, the roller is pressed downward, opening a by-pass valve and allowing the oil to pass freely around the control valve to the cylinder of the traversing mechanism, which in turn causes the slide to move back to its rearward limit at the highest rate of travel.

The wheel slide will then remain in this position until the operator tips the reversing lever by means of the ball handle, thus causing the slide to move forward at the high rate of speed until the pointed bar previously mentioned is clear of the roller, when the slide will resume its reciprocating motion between the limits for which the reversing dogs are set and at the rate it had previously been traveling. All this sequence of movements is accomplished by the simple act of raising the hand lever, and no manipulation of valves or other levers is needed.

The cross-feed mechanism and positive sizing stop are shown in Fig. 2. The direction of movement of the cross slide has been reversed in the present machine, so that the feeding pawls now act downward instead of upward as formerly, and the stop and its adjustments are on top of the ratchet. The stop shown over the ratchet wheel is attached to the machine base, and the position of the lever striking it is determined by the pawl. A movement of this pawl equal to one notch on the ratchet wheel corresponds to an increment of 0.0001 in. in diameter of the hole being ground. Graduations on the beveled face of the ratchet facilitate the setting of the lever to major divisions.

When the lever contacts with the stop there can be no further movement of the cross-slide in the forward direction. If, however, it is desired

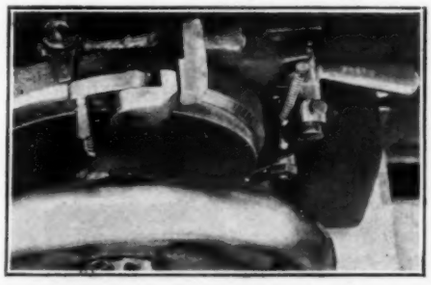


FIG. 2—POSITIVE STOP AND HAND FEEDING LEVER

to run the wheel beyond the predetermined position, the stop may be lifted out of the path of the lever and the cross screw turned by hand. When the slide is brought back to the grinding position and the stop again lowered to place, the machine will size as before, no change having occurred in the adjustment.

The small lever at the right is for feeding the cross slide by hand. Each depression of this lever causes an increase of 0.0001 in. in the diameter of the hole being ground. This movement may be repeated at will, except that the wheel cannot be fed beyond the position determined by the sizing stop, without lifting the stop as just described.

The water guard enclosing the chuck is overbalanced by a spring and is held in closed position by a catch. A pressure of the finger upon this catch releases the guard and causes it to open as shown in Fig. 3, where it remains until closed by the operator. The supply of water or grinding compound is automatically shut off by the movement of the clutch lever that stops the rotation of the work spindle.

The diamond truing device is mounted upon a separate bridge that, once set for the desired position, has no further movement relative to the machine base. The diamond holder can be swung up out of the way of the wheel. When brought to its lower or active position, the point of the diamond is in a straight line with the back side of the hole being ground, and thus constitutes a sizing device of itself.

The diamond may be allowed to remain in the active position during the grinding, with the wheel passing over it at each reversal of the wheel slide. A hole cannot then be ground too large for the reason that if the wheel should be accidently or intentionally fed forward beyond the correct sizing position, it would be turned off by the diamond before it could enter the work.

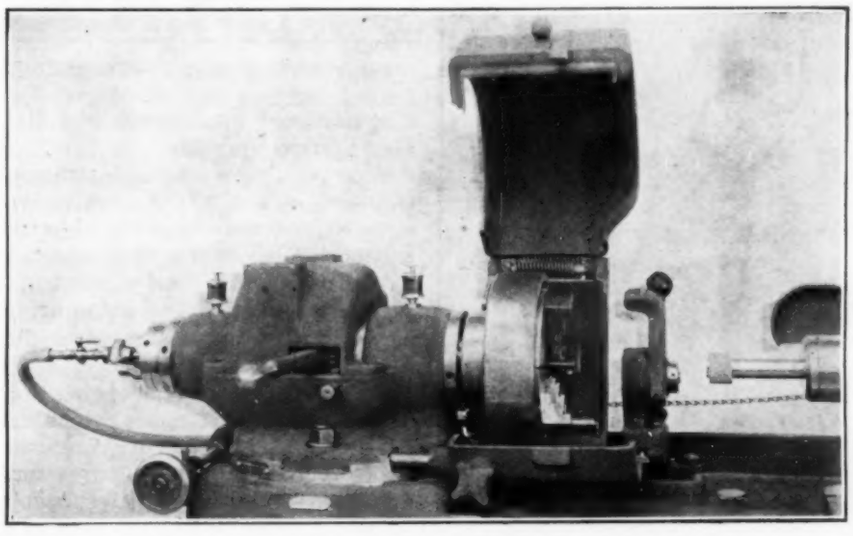


FIG. 3—COUNTERBALANCED WATER GUARD

"Cutwell" Taper-Pin Reamer

The Wells Corp., Greenfield, Mass., has recently brought out the "Cutwell" taper-pin reamer, incorporating therein some principles not ordinarily found in this class of tool. Instead of straight or left-hand helical flutes, the helix is right-hand.

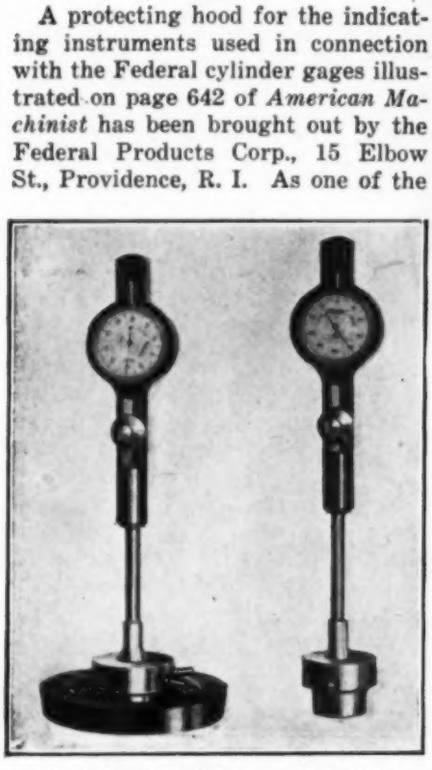
"CUTWELL" TAPER-PIN REAMER

The "lands" of the reamer are relief ground in the same manner as on a twist drill; and it is claimed by the makers that this treatment entirely eliminates any tendency of the tool to draw in, while the right-hand helix assures an easy shearing cut and at the same time carries the chips out at the large end of the hole.

The reamer is made in all standard taper-pin sizes.

Hood for Federal Dial Gages

A protecting hood for the indicating instruments used in connection with the Federal cylinder gages illustrated on page 642 of *American Machinist* has been brought out by the Federal Products Corp., 15 Elbow St., Providence, R. I. As one of the



PROTECTING HOODS ON FEDERAL CYLINDER GAGES

principal applications of these tools is in connection with the repair of automobiles, and as the dial indicator is an instrument too sensitive and delicate to withstand the abuse to which it would be subjected in the average garage, the hoods have been applied to protect the indicators.

The hood surrounds, but does not touch, the indicator, as the accompanying illustration shows. The recess is somewhat larger than the diameter of the indicator and its depth greater than the thickness of the latter, so that, although the dial is at all times plainly visible, it would be difficult for a blow of sufficient force to cause injury, to reach the delicate mechanism.

Bacharach Radiation Pyrometer for High Temperatures

The Bacharach Industrial Instrument Co., Pittsburgh, Pa., has recently placed on the market a high-temperature radiation pyrometer, called the "Ardometer," which is

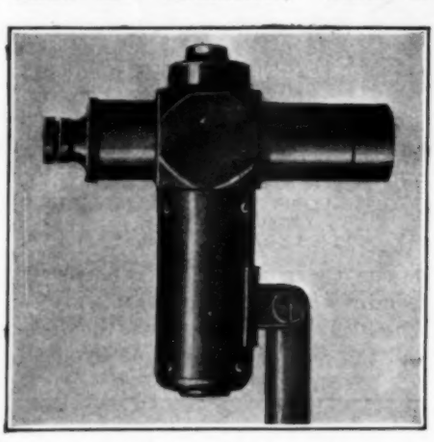


FIG. 1—BACHARACH "ARDOMETER"

manufactured by Siemens and Halske, Berlin, Germany.

A general view of the instrument is shown in Fig. 1. The device consists of a telescope, with objective and ocular lenses, between which is located a small thermal element in a sealed glass bulb. The hot junction of this thermal element is soldered to a thin, blackened platinum disk, the free ends of the couple being connected to a galvanometer which can be either indicating or recording. Protection is provided against dust and dirt for this sensitive couple, while the objective lens can be readily cleaned.

When the temperature of an incandescent body is to be taken, the instrument is sighted directly on this body, the total radiation of a definite area of the body being concentrated upon the blackened disk by the objective lens. In this way the hot junction of the couple is heated and the emf. generated sends through the circuit a current which causes a deflection of the galvanometer pointer. The thermal energy is thus transformed into electric energy, and since the former is proportional to

FIG. 2—ARDOMETER PERMANENTLY MOUNTED IN A GUARD

the fourth power of the absolute temperature of the incandescent body, it follows that the latter, and with it the galvanometer deflection, is proportional to the fourth power of the absolute temperature.

For this reason the galvanometer has widely separated divisions at the upper section of the scale. Standard scales having maximum readings of from 2,200 to 4,600 deg. F. are available. Smaller ranges than 2,200 deg. F. are not obtainable because the emf. generated would be too small. To adjust each Ardometer for any one of the ranges, a diaphragm is provided just behind the objective lens. The position of this diaphragm cannot be changed after calibration, but all instruments calibrated for the same range are interchangeable, because they generate the same emf. at equal temperatures. Therefore one indicator with a selective switch or a multiple recorder can be used for several Ardometers.

Since the platinum disk and the wires of the couple are very thin, the Ardometer is claimed to have practically no heat inertia and to follow each fluctuation of the glowing body instantly, giving correct readings only a few seconds after focusing. Double pivoted galvanometers may be used, since the emf. generated is comparatively high.

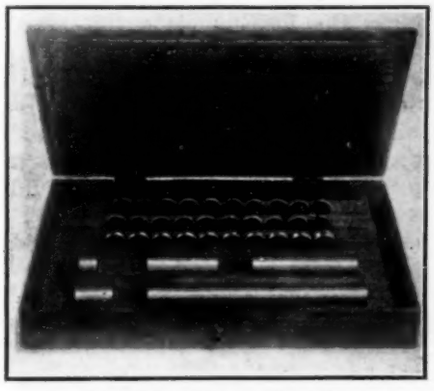
The Ardometer may be permanently installed or used as a portable

instrument. In operation after being properly connected to the indicator or recorder, it has only to be sighted on the glowing object in such a way that the black platinum disk as seen through the ocular lens is perfectly covered and surrounded by radiation of light. Protection against excessive radiation during focusing is provided for by means of a red glass accompanying the instrument. The glowing area must possess a diameter of at least 2.6 in. when the distance between the sight object and the Ardometer is 3 ft., while the glowing diameter must be proportionately larger or smaller at other distances.

The instrument can be mounted on a pedestal or tripod, or it may be fixed to a shelf or other holder. To guard against mechanical injury it can be placed in a simple iron protection as shown in Fig. 2. The Ardometer itself weighs one pound and is 5 in. long and 5 in. high.

Van Keuren 0.0001-Inch Micro-Gage Set

The Van Keuren Co., 362 Cambridge St., Allston, Boston, Mass., has recently added to its line of measuring tools a complete set of micro-gages arranged to give readings in ten-thousandths of an inch. The set, as shown in the accompanying illustration, is intended mainly for the purpose of checking micrometers, and for direct use on parts being machined.



VAN KEUREN 0.0001-INCH MICRO-GAGE SET

In all, the set contains thirty-five gages. The sizes provided are: A ten-thousandths series of ten gages from 0.1000 to 0.1009 in., a thousandth series of ten gages from 0.101 to 0.110 in.; a hundredth series of nine gages from 0.12 to 0.20 in.; and additional gages of 0.3, 0.5, 1, 2, 3 and 6 in. Over 140,000 combinations are available.

A feature of this set is the use of the 6-in. gage instead of the 4-in. gage. With this 6-in. gage the range of the set is up to 14 in. in length. The large gage can also be used to increase the range of existing sets of combination gages.

Golden Combination Blackboard Drawing Instrument

The Golden Co., Elkhart, Ind., has recently placed on the market the combination blackboard drawing instrument shown in the accompanying illustration. This instrument is similar in construction and operation to the one described on page 565, Vol. 58, of the *American Machinist* and it embodies a number of features which make it adaptable for blackboard use.

The device combines a compass, rule, protractor and T-square all in one, and is arranged with a vacuum cup pivot for holding the instrument on the board and allowing it to rotate freely. By depressing the knob on this vacuum cup, the air is exhausted from the rubber cup, creating a vacuum which is claimed to hold the instrument in position on the blackboard from 10 to 15 minutes.

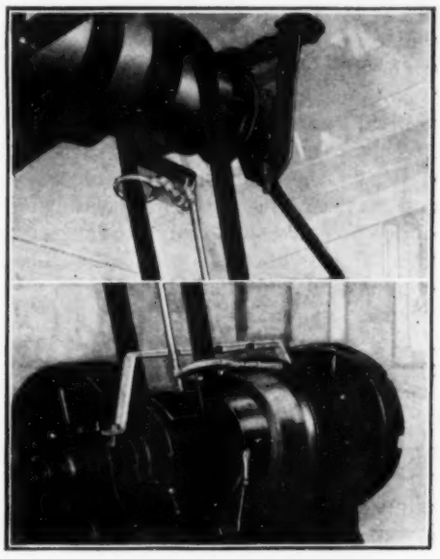
The rule is 18 in. long and has chalk holes every inch of its length for use in the describing circles; the protractor is graduated to 5 deg., and the T-square has a cross bar graduated to ½ in. All metal parts are finished in nickel. The zero point on the protractor is exactly in line with the ruler, so that by registering angles on the protractor the rule is automatically put into proper position for drawing lines at the desired angle.

The instrument has a number of uses such as describing circles, constructing angles of any degree, drawing parallel lines, and various geometric figures which are desired when explaining theories in school, shop and apprentice classrooms.

Reeve Belt Shifter

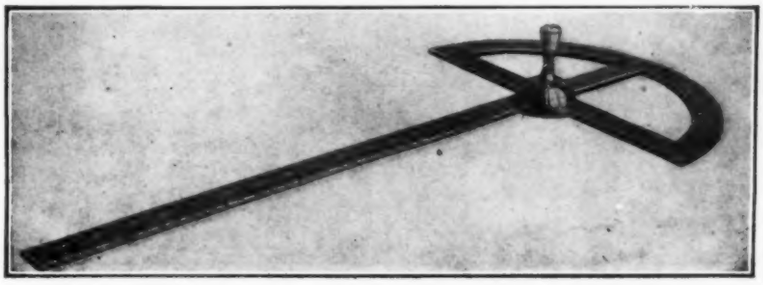
The cone-pulley belt shifter shown in the accompanying illustration is made by G. A. Reeve, 916 Hill St., Middletown, Ohio. The shifting movement is very similar to that used by a mechanic in shifting cone-pulley belts by hand.

In shifting the belt when in the position shown, the operator first swings the handle to the left, which runs the belt off the countershaft pulley and down onto the next step. He then places the vertical rod in the next notch on the bar over the lathe cone and swings the handle to the right. This puts the belt on the next size of pulley. Two or three steps may be changed at a time if desired, and the movement requires the use of but one hand.



REEVE BELT SHIFTER

The shifter is made in various sizes and styles to fit lathes, milling machines, drilling machines, or any machine using a cone-pulley drive. It is strong and simple, with practically nothing on it to get out of order. The entire installation weighs about 25 lb., and drilling and tapping are the only operations needed to put it in place on the lathe and shafting.



GOLDEN COMBINATION BLACKBOARD DRAWING INSTRUMENT

Cleveland Hand Spacing Table for Punch Press

The Cleveland Punch & Shear Works Co., Cleveland, Ohio, has recently placed on the market the 40-ft. hand spacing table for punch presses that is shown in the accompanying illustration. The table may be used with practically any open-gap single punching machine or regular I-beam type machine.

The table is of the open-side single-rail type and permits of loading and unloading directly from the front. The moveable rail is guided between rollers located on the stationary tie rails and is fitted with end castings carrying the clamps. One end casting may remain stationary, while the opposite end can be adjusted to suit the length of the material. The clamps and end castings may be returned over the fabricated material for re-loading, and hence it is not necessary to unload before returning the rail for re-loading. A 36-in. handwheel propels by means of a rack and pinion the moveable rail, to which the work is clamped. The material supporting rollers are raised and lowered individually by means of a crank.

The stopping of the table may be accomplished in various ways as follows: By the use of adjustable stops made of rectangular pieces of steel; by hardwood stops with pins; or by notched wooden templets. These stops are inserted in a slot at the side of the table. By revolving the handwheel in the direction of travel of the material, the first stop is brought in contact with a stationary dog. At this point a hole is punched and the handwheel is then rotated slightly backward, which withdraws the dog so that the stop can pass. Then the handwheel is again rotated forward until the dog comes into the path of the succeeding stop. The backward movement of the handwheel does not move the material backward. A steel tape is inserted along the side of the table to facilitate the setting of the adjustable stops.

The table will handle as a maximum a 24-in. I-beam with the material supporting rollers in their lowest position. All other structural members such as beams, angles, channels and plates reaching the full depth of the throat, may also be punched.

Federal Dial Comparator

The dial comparator shown in Fig. 1 has been designed by the Federal Products Corp., 15 Elbow St., Providence, R. I., for the purpose of checking errors of dimension during the process of manufacture of any small parts that are required to be within close limits of accuracy. It is not

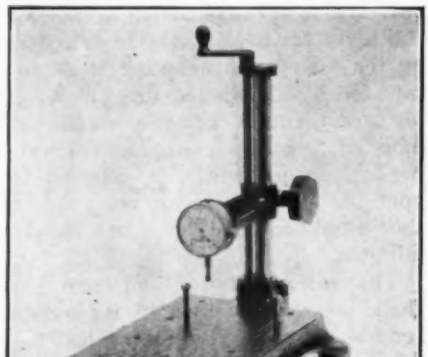


FIG. 1—FEDERAL DIAL COMPARATOR

intended as a measuring instrument to determine exact dimensions, although it can be so used by checking the parts against a known standard; but it is rather a comparator, as its name implies, for indicating the amount of departure from predetermined sizes.

The base forms a convenient table upon which to lay the work to be inspected, and is provided with ¼ in. tapped holes for the purpose of attaching fixtures to hold work of special shape. An arm extending over the base carries at its end a dial indicator graduated to half-thou-

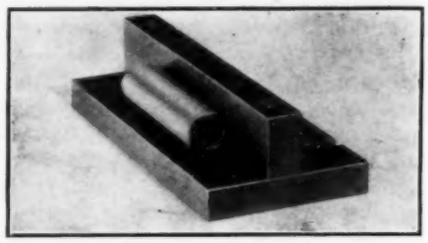


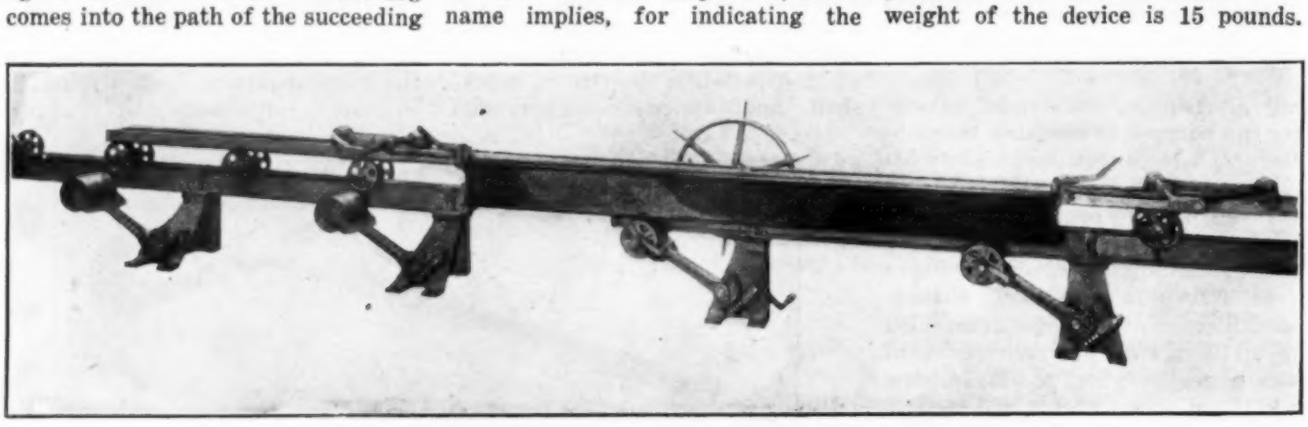
FIG. 2—FIXTURE FOR HOLDING ROUND WORK

sandths of an inch and registering a total variation of but 0.020 in. for each complete turn of the pointer. The arm slides upon a graduated post and may be elevated by means of the screw and crank handle. When adjusted to the nearest major division on the post, the arm may be clamped firmly to prevent accidental movement.

Minor adjustments are then secured by turning the knurled bezel ring; and when the pointer is once adjusted to zero with a standard or piece of work known to be correct under the measuring bar, it, also, may be clamped in place.

The fixture shown in Fig. 2 is provided for the purpose of gaging piston pins, bushings, or other round work. It is of steel, hardened and ground accurately parallel in all directions. Its use enables the operator to place such pieces quickly and exactly with the maximum diameter under the measuring bar.

The base is provided with rubber pedestals to absorb vibration. The weight of the device is 15 pounds.



CLEVELAND 40-FOOT HAND SPACING TABLE FOR PUNCH PRESS

News Section

Discussion on Flat Rate Service Feature of Service Managers' Meeting

THE REGULAR Spring meeting of the factory service managers' division of the National Automobile Chamber of Commerce was held on the fifteenth floor of the General Motors Building, Detroit, Mich., on May 15 and 16. Over one hundred delegates representing more than fifty companies were present and there were also a dozen guests representing various trade papers.

The meetings were presided over by F. J. Wells, Pierce-Arrow service manager and chairman of the Service Committee of the N.A.C.C. H. R. Cobleigh, secretary of service, N.A.C.C., acted as secretary.

Conspicuous among the good addresses at the various sessions was the opening address by B. G. Koether of the General Motors advisory staff. Mr. Koether had prepared a balance sheet on which were listed the various items to the debit and credit accounts of the automobile industry. Prominent among the debits were the annual toll of 350,000 killed and injured by motor vehicles, some 2,000 bills against automobilists pending in various legislatures and the growing competition of taxicab, street railway and steam railroad operators. On the credit side the things that stood out were the undeniable fact that automobile builders are supplying a product for which there is a universal want, and the relatively low prices at which motor cars are sold. The other speaker at the first session was L. V. Pulsifer, vice-president, Valentine & Co., who gave a brief talk on how to care for automobile paint jobs and then spent the better part of an hour answering very specific question fired at him from all sides.

Flat-Rate Service Discussed

The discussion on flat-rate service was opened by Richard Harfst, general manager, Cadillac Detroit branch. He described a successful system by which the owner is looked after by the same man each time he comes in for service. The men who meet the customers are known as service salesmen and each is responsible for the satisfaction of his customers. Each one averages better than twenty customers attended daily. In the discussion that followed it developed that no one has as yet reached the ultimate ideal of being able to tell the customer just what any particular job will cost. Many have reached such a point as regards labor, but not where parts are concerned. Steady progress in the right direction is apparent, however.

Advertising and education, both of the dealer and of the public, were discussed on the second day of the meeting. The speakers were J. H. Newmark, manager of sales promotion, Durant Motors, Inc., whose subject was "Service Promotion Through Advertising," and T. W. Holloway, assistant technical manager, Cadillac Motor Car Co., who spoke on "Methods of Instructing Dealers' Mechanics." The afternoon session was concluded by motion pictures showing how the fundamentals of automobile operation and care can be taught on the screen.

Business in Chicago Is Unchanged

The Santa Fe Ry. has issued inquiry for about seventy-four machine tools, but states that it probably will be five or six weeks before it closes and there seems to be some uncertainty as to whether it will make any purchases at this time.

Machine tools in Chicago continue to move rather slowly, a dealer reporting fairly good business so far this month and another reporting that he had very few sales. The small tool business for the Chicago district, which was reported as being slow last month as to volume of sales in monetary comparison, has had the opposite experience so far this month and report that small tool sales are at least twenty per cent above sales for the same number of days in April.

Chicago dealers in machine tools and kindred lines state that while there exists considerable uncertainty as to the future course of business and industry, there are various indications that the present wave of pessimism is being sharply overdone.

The midweek trade reviews present a varied picture of industrial operations, but from them it would appear that the observance of conservatism and caution has been and is being too much construed as a decided letdown. The steel industry continues operations at about 94 per cent of capacity, while the automobile industry is going at top speed, with the prospect that a new high production record will be set this month.

New England S. A. E. Elects Officers

Ralph E. Northway, president of Northway Motors Corp., was elected chairman of the New England section, Society of Automotive Engineers, at the section's final meeting of the season in Springfield, Mass., May 17. H. E. Morton, of Sturtevant Blower Works, the outgoing chairman, presided at the meeting, which was attended by forty members. Following the business meeting, Mr. Northway gave a talk on automobile springs, spring suspensions and spring materials. The U. S. Department of Mines' film, "Alloys of Steel," was shown at the conclusion of Mr. Northway's talk.

Officers elected, in addition to Mr. Northway, were: vice president, E. O. Sutton, Knox Motors Co.; secretary, V. E. Neilsen, V. A. Neilson Co., Boston; treasurer, Linwood H. Young, Boston.

Office Managers Plan Annual Conference

The fourth annual conference of the National Association of Office Managers will be held in Detroit, June 14-16 inclusive.

The meeting will be addressed by many speakers of note, and will include such topics as "Education the Basis of Office Management" by W. W. Kincaid, president of the Spirella Co., Niagara Falls; "Salary Standardization" by Harry A. Hopf of New York; "Office Machinery in the Reduction of Office Expenses" by H. A. Piper of E. I. du Pont De Nemours & Co., Wilmington, and "Helping Our Schools to Help Industry" by Frank P. Hamon of the Goodrich Rubber Co., Akron, Ohio.

Two sessions of the conference will be set aside for round table discussions, led by authorities on such subjects as "Increasing Office Productivity by Bonuses and Ratings"; "Application of Planning Principles to Office Work"; "Office Manuals and Written Instructions"; "Cutting Red Tape"; "Mutual Service Work"; "Training."

A cordial invitation is extended to all interested in office administration to attend the convention. Further particulars may be obtained by writing the secretary of the association, G. S. Childs, Alexander Hamilton Institute, 13 Astor Place, New York City.

Machine Tool Makers at "Informashow"

Machine tools and castings of various kinds were in evidence at the "Informashow," an exhibit by manufacturers in many different industries, which is in progress in connection with the National Purchasing Agent's Convention at the Public Auditorium, Cleveland, Ohio. The exhibitors expect to derive advantage from the show by informing purchasing agents about their products. Some of the exhibitors are: the Cleveland Tool & Supply Co., the Cleveland Twist Drill Co., the Detroit Twist Drill Co., the Ferry Cap & Set Screw Co., the Lunkenheimer Co., the Milwaukee Die Castings Co., the National Tool Co., the National Twist Drill & Tool Co., the Oxweld Acetylene Co., the Vlchek Tool Co., the Wheel Trueing Tool Co.

J. Walter Drake Named Hoover's Aid

J. Walter Drake, an automobile manufacturer of Detroit, has been selected to fill the vacancy in the office of the Assistant Secretary of Commerce, created by the resignation of Claudius H. Huston. Mr. Drake formerly was the president of the Hup Motor Car Co. and at present is the chairman of its board of directors. He is a lawyer by profession, but most of his career has been devoted to manufacturing activities.

Manufacturers Discuss Important Questions

Annual meeting held by National Association in New York and many prominent speakers are heard—Platform adopted and important actions taken

WITH NEARLY six hundred manufacturers from every section of the country, among them many men prominent in the affairs of the nation, the National Association of Manufacturers concluded its twenty-eighth annual convention at the Waldorf Astoria Hotel, New York City, Wednesday evening, May 16, after three days devoted to the discussion of questions of importance to every business man in the United States. The convention was from every standpoint the most successful that has ever been held by this body of representative men and the sessions were well attended.

Interest was shown from the opening meeting held Monday afternoon when the reports of the secretary and the treasurer were read and the reports from the committees on immigration, industrial relations, patents and trade marks and taxation were received. The latter reports were printed in booklet form and distributed to the delegates.

John E. Edgerton, president of the Association and a prominent textile manufacturer of Tennessee, delivered the annual survey of conditions in the country in the various industries.

"Production as compared with last year is showing an increase of something like forty per cent in all lines of manufacture with excellent prospects for the Fall," declared President Edgerton. "Stocks on hand are reported generally as low or normal, indicating that sales are keeping ahead of or abreast with production—another most healthy sign.

"Present trade in the machinery, tools and hardware division is reported as excellent to fair in ninety-eight per cent of the reports, expectations of good Fall business is in the same proportion and business is higher than last Spring in practically all plants. Employment has increased in ninety-eight per cent of the firms reporting and eighty-six per cent need more men. Production has increased on an average of fifty-four per cent.

"Eighty per cent of the automobile men report present business as excellent. All of them see hopes for exceptional business in the Fall. There is a labor shortage in seventy per cent of the plants reporting."

Industrial Production Session

On Monday evening an industrial production session was held and addresses were made by Dr. David Friday, president of the Michigan Agricultural College whose subject was "Economic Need for Increased Production"; Acheson Smith, vice-president of the Acheson Graphite Co., Niagara Falls, N. Y., whose subject was "How Management Can be Made More Productive"; M. C. Rorty, president of the Telephone Securities Co., New York, whose subject was, "Economic Tendencies," and Harold C. Smith, president of the Illinois Tool Works, Chicago, Ill., whose subject was "How Labor Can be Made More Productive." The speeches of both Acheson Smith and Harold C. Smith will appear in forthcoming issues of the *American Machinist*.

Mr. Rorty stated that the primary need today is for restraint and caution and for an absence of political interference with the credit system. He pointed out that during the last three years greater attention had been paid to the study of financial conditions in this country. He further said that there was little desire on the part of the people to return to a pre-war standard of money values and that both bonds and mortgages were being renewed at present rates with no complaints.

Dr. Friday stated that the real grievance of the farmer was that the city worker had been able to enjoy more leisure and also improve his standard of living, while the farmer had been unable to either work less hours or to improve.

Interest was shown in the reports that were submitted in the afternoon from the various committees and at the evening sessions they were the subject of much discussions by the delegates. The committee on immigration in its report stated that a selective immigration rather than a prohibitive one was favored and that it should be made flexible to meet the varying needs of the country.

Committees' Reports

The committee on taxation expressed opposition to the proposed amendment to the Federal Constitution that would bring under the taxing power of the Federal Government the income of bonds that may hereafter be issued by state, counties or municipalities. It was pointed out that such an amendment would tend to destroy the credit and borrowing power of states and other bodies that now have tax exempt bonds.

The committee on industrial relations urged that the association take steps to develop a plan of constructive education for managers and workers in industries in the fundamental principles of economics.

Mr. Edgerton in his annual address on Tuesday morning outlined the aims and hopes of the association and also told of the many plans that were now being formed to continue some of the work that has been commenced, but that had not as yet been completed. Mr. Edgerton discussed among other things the tariff; taxation, which he said was the most important subject before the people today; the soldiers' bonus, which he said the association was opposed to but not to any efforts to help the wounded and disabled soldiers of the country; the railroads, decrying any attempt that may be made to place them under the unbusiness-like management of the Government; immigration, reiterating the policy of the association on selective immigration, and on law and order, declaring the efforts of misinformed groups to develop disrespect for our institutions, made it incumbent upon every real American to give his strongest support to constituted law.

"We should never be in the attitude of apologizing for or defending anyone who brings dishonor to the lofty standards and exalted principles for which we stand," declared Mr. Edgerton. "On the other hand, we should be as swift to condemn and as ready to help discover and punish the crookedness or criminality among those of our own number as among those of any other class.

"Personally I have more profound contempt for the employer of labor who may be a crook than for an employee, because the former had better opportunities for knowing the right, less reason for departing from it and greater obligations to lead through both precept and example."

Dr. Benjamin M. Anderson, Jr., of the Chase National Bank, New York, was the speaker following Mr. Edgerton. Dr. Anderson stated that the present lull in business was merely a slowing down of the too rapid pace of the first few months of the year and that he had every confidence that the effect would be wholesome and that the era of prosperity would last the longer if it was less speedy.

Zenas W. Bliss, chairman of the board of Tax Commissioners of Rhode Island spoke on "Taxation."

At the luncheon Tuesday noon the diners were refreshed with the speech delivered by Will Rogers, the cowboy-comedian, who has spoken at many banquets this year. Rogers was merciless in his barbs, stating that one of the best ways of helping the railroads would be to attend fewer conventions. His remarks were met with gales of laughter and his speech acted as a great relief from the serious problems that were being discussed in the business sessions of the convention.

Tuesday afternoon's session was devoted entirely to the open shop discussion. Mr. Edgerton stated the position and policy of the association at the opening of the meeting. He declared that the open shop was an obligation that industry owed to American principles and that it was one phase of the fundamental doctrine of the right of free choice with which every man is born, giving to individuals the right to choose their church affiliation, lodge affiliation, lines of endeavor and their life companions. This principle, he stated, logically extended to the question of affiliation or non-affiliation with labor organizations.

Attitude on Open Shop

"The open shop" declared Mr. Edgerton, "as the National Association of Manufacturers views it, does assert that employers can discriminate between employees on the basis of their efficiency, honesty, loyalty and ability to co-operate with others. It likewise justifies discrimination against members of unlawful organizations, or of labor organizations that are not operating in a lawful manner."

Edwin H. Marble, president of the Curtis & Marble Machine Co., Worcester, Mass., stated that manufacturers should use more head work in bringing about a better understanding among the workers and that the importance of

harmony in relation to prosperity should be emphasized. He declared that the development of good-will and mutual interest between employer and employee was the most important problem in the open shop operation. The rights of the workers should receive attention as well as the requirements of the employer, he stated.

Capt. Robert Dollar, San Francisco, said that the Western city was an open shop town and that it was also a good union labor town and that this condition had been brought about by everlasting teamwork.

ADOPT PLATFORM

New immigration laws based upon a selective policy, tax revision, a scientific adjustment of the tariff and encouragement to the railroads of the country were urged as a platform prepared Tuesday evening by the association. Copies will be sent to each of the major political parties and will also be forwarded to the House of Representatives and the Senate at Washington.

The session Tuesday evening was in the form of an informal smoker with J. H. Tregoe, secretary-treasurer of the National Association of Credit Men, acting as chairman. Brief talks on a variety of subjects were given.

Wednesday morning Carl R. Gray, president of the Union Pacific Railroad, spoke upon "Transportation." He stated that the best way to help the railroads was to allow the Esch-Cummins law alone and that the problems would be worked out all right. He said that while some of the sections were unsatisfactory there would be little advantage in tinkering with the law.

John J. Cornwall, former Governor of West Virginia and general counsel for the Baltimore & Ohio R.R., in speaking of the coal situation in this country stated that the next great fight between the United Mine Workers and the operators would be over an attempt to nationalize the mines of the United States. He stated that this issue had been taken up by the miners in several conventions, but that it had never been pushed on account of strategic reasons.

James A. Emery, general counsel for the association, was the chief speaker at the Wednesday afternoon session. He pointed out that the most serious charge against business men today was that they were the makers of the very conditions of which they most frequently complained. Mr. Emery also spoke on immigration, taxation, tariff and the world court, saying that leading business men of the country had favored the world court long before there was any mention of a League of Nations.

RESOLUTIONS PASSED

The committee on resolutions reported the following resolutions; supporting the coal industry and the fuel administrator, the national budget system, selective immigration, enlarging the powers of the debt funding commission on foreign relations, the necessity of developing a plan of national transportation and the belief in the privately owned railroads, endorsing the protective principle of the tariff as an effective safeguard to American standards, the merchant marine, and as opposed to the soldiers' bonus, and the change in the present system of the United States Supreme Court.

At the annual dinner held Wednesday evening, Ben W. Hooper, chairman of the United States Railroad Labor Board was the speaker of the evening. Mr. Hooper decried socialism and stated that many crimes were committed in the name of progressivism.

Mr. Edgerton was again elected president of the association and the other officers were also re-elected. The vice-presidents, who form the board of directors for the coming year are the following: H. C. Atkins, F. C. Atkins Co., Indianapolis, Ind.; William H. Barr, Lumen Bearing Co., Buffalo; W. R. Bassick, Turber & Seymour Manufacturing Co., Torrington, Conn.; Hays Clemens, Hays Manufacturing Co., Erie, Pa.; Herbert F. Cushman, Morse Twist Drill & Machine Co., New Bedford, Mass.; Augustine Davis, Davis Automatic Equipment Corp. J. H. Frantz, American Rolling Mill Co., Middletown, Ohio; C. Parker Holt, Holt Tractor Co., Stockton, Calif.; G. O. Illingsworth, Anniston Electrical Steel Corp., Anniston, Ala.; J. L. Kimbrough, Indiana Bridge Co., Muncie, Ind.; John Kirby, Jr., the Dayton Manufacturing Co., Dayton, Ohio; F. B. Leigh, Chicago Railway Equipment Co., Chicago, Ill.; A. J. Lindemann, A. J. Lindemann & Hoverson Co., Milwaukee, Wis.; B. F. McCarthy, Phillips & Buttorff Co., Nashville, Tenn.; George L. Markland, Jr., Philadelphia Gear Works, Philadelphia; Stephen C. Mason, the McConway & Torley Co., Pittsburgh, Pa.; A. H. Mulliken, Pettibone-Mulliken Co., Chicago, Ill.; R. W. Nelson, American Typefounders Co., Jersey City, N. J.; John Trix, American Injector Co., Detroit, Mich.; Clarence E. Whitney, Whitney Manufacturing Co., Hartford, Conn.; Edward Weston, Weston Electric Instrument Co., Newark, N. J.; George H. Wilson, United States Bobbin & Shuttle Co., Providence R. I.

In addition to the above directors the following were elected vice-presidents of the association: Thomas S. Tuley, Louisville Cotton Mills, Louisville, Ky.; M. F. Finck, Murray Iron Works Co., Burlington, Ia.; J. J. Holloway, Wheeling Steel Co., Wheeling, W. Va.; J. P. McGoldrick, McGoldrick Lumber Co., Spokane, Wash.; F. C. Knapp, Peninsula Lumber Co., Portland, Ore.

Missourians on Guard for Inflation Evil

Although business in St. Louis continues at a good rate and most all shops are working full time, and the machine tool industry is sharing in the general healthy condition of all business, there is a well directed effort on foot to guard against the grave danger of inflation that menaces the country during any period of prosperity. Prices are being kept within limits as well as the wages paid to mechanics. Efforts to capitulate to demands for increases of rates are being handled by associations in a way which it is anticipated will have the most beneficial effect upon all concerned.

However, the safeguarding against catastrophe does not extend so far as to omit making the necessary repairs and expansions which the increase in the volume of business justifies. Factories and other manufacturing and business establishments applied for forty building permits in St. Louis during the month of April and it is expected the total value of the work will be $1,501,250 or more.

The financial reports of railroads show that all of them are reaching a better condition and in most every case their receipts are increasing. That class of business, of course, supplies a good part of the demand for tool machines in the St. Louis territory and it is due to orders which they have already placed that shops are so well employed.

Business in Milwaukee Is Satisfactory

Milwaukee machine tool manufacturers are receiving encouragement in the form of a sprinkling of orders from railroads, the requirements of which indicated by lists now coming out doubtless will furnish a growing volume for the remainder of the year. This class of business is gradually predominating machinery business, for it is apparent that automobile shops have filled the major share of their needs and are now buying sparingly. On the whole, business in May so far has held up fairly well in comparison with April.

Builders of machine tools, while not called upon to employ their entire available capacity, are complaining of the shortage of skilled labor and they especially decry the tendency among some machine tool users of hiring away at premium wages some of their best men, which reflects the present strenuous effort of employers in the metal trades to derive the greatest output possible with tools at hand to overcome so far as possible the dwindling supply of workers capable of handling such machines.

Manufacturers of milling machines, who form an important part of the machine tool industry in Milwaukee and vicinity, are behind on orders for certain types which have been recently developed and embody high output capacity in addition to a wide range of use for toolroom as well as production floor purposes. On the other hand, the standard or stock types are rather inactive. The effort of tool users appears strongly to be directed at obtaining equipment that will not alone save manual labor but to fortify themselves against the growing shortage of workmen. This is not a new desire, but it is more pronounced now than even during the war period when maximum production was an absolute necessity.

Two Auto Body Builders In Merger

Following meetings of the stockholders of both corporations, it became known that the Trippensee Manufacturing Co., maker of automobile bodies, and the Everitt Bros. Corp., automobile trimmer and top manufacturer both of Detroit, had voted to consolidate the two concerns, and that terms for the immediate putting into effect of the merger had been agreed upon.

Under the terms of the merger, the new corporation will be known as the Tippensee Closed Body Co., and all the various plants of the two old companies will be utilized. By the consolidation it is expected greater output may be accomplished.

Machinery Men Hold Big Triple Convention in Cincinnati

Three day meeting largely attended—Representative machine dealers and manufacturers from all over the country are present—Optimistic business outlook prevails

THE American Supply and Machinery Manufacturers Association, the National Supply and Machinery Dealers Association, and the Southern Supply and Machinery Dealers Association held a three-day triple convention May 17, 18 and 19 at the Sinton Hotel, Cincinnati, Ohio.

The first session was a joint meeting of the three associations and was held at 10 o'clock Thursday morning. After singing "America," the address of welcome was given by the Hon. Geo. Puchta, of the Queen City Supply Co., former mayor of Cincinnati, and one of the founders of the National Machinery Dealers' Association and its second president.

Following Mr. Puchta, Irving W. Lemaux, of the Indianapolis Brush & Broom Mfg. Co., and president of the American Supply and Machinery Manufacturers Association, sounded a warning against radicalism. He urged business men to take a more active interest in politics and to combine, regardless of party affiliations, to defeat radical candidates for office. He said that if business men took a more active interest in political matters, we would have more statesmanship and less petty politics. He pointed out that just at present business in this country was on a boom, but if radicalism were permitted to get the upper hand, as it had in some other countries, the boom would be of short duration.

The next speakers were W. J. Radcliff, president of the National Supply and Machinery Dealers' Association, and Thomas G. Hyman, president of the Southern Supply and Machinery Dealers' Association, who followed in spirit the utterances of the previous speaker.

Five-Minute Speeches

Following these speeches, fifteen selected men from the three associations spoke for five minutes each on "Business Conditions." All emphatically repeated that the business outlook was very bright and that present conditions were good and constantly improving.

Thursday afternoon was taken up with an executive session of the American Supply and Machinery Manufacturers Association, which was for members and invited guests only. While the men were in session the ladies were entertained by a tour of inspection to the Rookwood Pottery, the Cincinnati Art Museum and the Loring Andrews store. In the evening a majority of the delegates were entertained at a boxing contest at Fort Thomas, given by members of the post. Others who did not care to go to the boxing exhibition were entertained at the Cox theatre.

A joint session of the Southern Supply and Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association, was held Friday morning. Discussions were led on cash discounts, by M. B. Skinner, of Chicago; on standardization, by Paul Armstrong, of the Armstrong Bros. Tool Co., Chicago; and on closer cooperation between manufacturers and dealers, by Farnham Yardly, of Jenkins Bros., New York. Of the last subject, the guiding topics were: "Should we give any support to those manufacturers who do not distribute through the dealers?" "Should the manufacturers place stock with local brokers for distribution and billing to purchasers on the manufacturers' stationery?" and "Can a jobber profitably handle drop-shipments at 5 per cent when cost of doing business for such is from 8 to 10 per cent?"

The Friday afternoon business session was a joint meeting of the National Supply and Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association. The discussions were on the same subjects treated at the morning session.

During the morning meeting the National Supply and Machinery Dealers' Association held a separate executive session, and during the afternoon meeting the Southern Supply and Machinery Dealers' Association held one.

The entertainment for the ladies Friday afternoon consisted of a bridge-luncheon at the Maketewah Country Club, and in the evening there was a dance and buffet supper in the ballroom of the Sinton Hotel.

On Saturday separate executive sessions of all three associations were held: The officers for the coming year elected by the National Supply and Machinery Dealers' Association were: W. J. Radcliff, of the E. A. Kinsey Co., Cincinnati, president; L. H. Swind, Philadelphia, first vice-president and B. H. Ackles, Detroit, second vice-president.

The officers elected by the American Supply and Machinery Manufacturers' Association were: Joseph M. Hottel, of the Delta File Works, Philadelphia, president: M. B. Skinner, Chicago, W. H. Fisher, Chambersburg, Pa., and L. L. Mather, Philadelphia, vice-presidents, F. D. Mitchell, 1819 Broadway, N. Y. was re-elected secretary-treasurer.

Notes on Washington Activities

By Paul Wooton

ANTHRACITE coal, in the opinion of John Hays Hammond, chairman of the President's coal commission, is paying a disproportionate freight rate. In making that statement, Mr. Hammond was careful to point out that the railroads must be allowed to earn reasonable profits, but he does believe they are collecting charges on anthracite coal which are out of proportion with the charges levied on other commodities. The fact that anthracite traffic originates in a comparatively small area and does not require the construction of additional side-tracks and can be concentrated easily in full train loads, should be reflected in the freight rate, Mr. Hammond believes. He also called attention to the fact that there are very great differences in favor of anthracite in the cost of handling bituminous and lanthracite coals. He admitted that the commission is considering a recommendation that the cost of service be made the basis for computing freight rates on anthracite.

No Cheap Coal Yet

Publication in the daily press of Mr. Hammond's statement in regard to anthracite rates gave rise to inquiries as to how soon a reduction might be expected. This led to a request that publication be made of the fact that no one should delay purchase of coal in the hope that a lower freight rate will be available in the near future. In that connection, attention was called to the fact that even should the commission vigorously recommend such a rate reduction, this does not mean that the Interstate Commerce Commission will act on the recommendation and even should it be disposed to embark upon a new study of anthracite coal rates, many months probably would be required for the hearings and other formalities in connection with such an investigation. The commission is anxious that the public understand that there is no prospect of any rate reduction for a year at least and no promise of a reduction at any time.

In sounding this note of caution, the commission has in mind the heavy losses which came to some consumers who delayed purchases of coal awaiting the much-heralded reduction in the rates on bituminous coal last year.

The commission has conferred at length with the independent anthracite operators, but no important new facts were brought out, Mr. Hammond stated. Much the same ground was covered as was the case when the company operators met with the commission. One of the interesting phases of the discussion, Mr. Hammond stated, pertained to methods of selling. He gave no details. There also was discussion of the possibility of improving methods of conciliating labor disputes. The operators have a variety of ideas, but all admit that there is no easy solution for any of the problems that the anthracite producers are facing. The commission has been advised that the report of the anthracite committee will be forthcoming in the very near future and that the report will be confined largely to constructive suggestions.

No portion of the anthracite report has been drafted as yet, Mr. Hammond asserted. The commission is reaching no conclusions since they have at their disposal returns covering only 30 per cent of the anthracite production in this country.

Holding on to Prosperity

Safeguards of prosperity—Effect of increased efficiency in production—The gold situation—Foreign trade, railways, coal—Our goal in economic life

By HERBERT HOOVER

I WISH on this occasion to review some of the more profound changes in our economic life during the past few years which I believe bear directly upon our present business situation. Many of the violent displacements of the war and post-war period have now been liquidated or absorbed into the economic fabric and no longer trouble us. We have spent 40 billions upon war; we have mobilized and demobilized 7,000,000 men; we have passed the great post-war crisis; we have recovered from an unemployment of 5,000,000 to a surplus of 500,000 jobs.

We have become economically stronger than before the war and this strength has radiated stability to the entire world. There are still some great shifts in the stream of our economic life to which we must accommodate ourselves if we would hold to full employment and prosperity.

Immediate Situation

During the past few weeks there has been a distinct note of caution at our rapid industrial recovery. I have shared in this but some have gone so far as to fear that we are entering a period of inflation or danger of collapse. Caution is the greatest safeguard to our continued prosperity, but caution need not be timidity nor exclusive of confidence and courage.

There are some parts of the building trades where there is strong pressure on prices and wages due to our large accumulated deficit in construction. There are parts of the agricultural industry that have not recovered to the extent of industry as a whole. I will refer to these situations later on. But outside of a very few commodities there has been a steady and rapid movement of all goods from raw material to the hands of the consumer and consumption is in pace with production. There have been no apparent large accumulations of goods. Moreover real inflation begins with large expectations and these expectations are not present.

There are very definite differences in our present economic position in the business cycle as compared with the situation prior to the collapse in 1920. The government index shows wholesale prices are today about 30 per cent below the crest at that time. This index shows an increase in wholesale prices of 6 per cent in the last nine months contrasted with a rise of 20 per cent in the nine months prior to the collapse in the 1920 boom. Increases in price are a necessary accompaniment of business recovery. They are the vital stimulant to production. They do not mean inflation unless they continue to rise after full production is attained or unless they are the result of speculation. We have been steadily increasing our production for the last eighteen months. Yet in the two years prior to the 1920 collapse there was comparatively little increase in production. Beyond this again we have had a very stable cost of living for over a year.

We have no need to go into a period of inflation. We are undoubtedly in a plane of prosperity and we wish to hang on to prosperity. I am not one of those who believes that hard times have any special advantage in disciplining our souls. We ought to be able to discipline ourselves in prosperity when we have time to do it and having achieved prosperity, we ought to be able to hold on to it.

Safeguards of Prosperity

The primary safety to continued prosperity will be continued willingness of our people to save their enlarged earnings, to resist extravagance and waste, to give full individual exertion. Our second safeguard rests upon the individual business man in today's well developed sense of caution and resistance to the will o' wisp of higher prices and over-expansion and speculation. Our third line of defense consists of our credit men and our bankers who can check the dangers of speculative credits. I speak of the credit men because the bankers are not the first to come in contact with the speculative buying. The danger point arises when there is an over-ordering of goods and the actual impact of these orders upon the credit machinery of the country does not arise for some time after such a movement has been initiated. Our bankers in daily contact with the commercial fabric of the country are fully alive to their responsibilities.

The fourth line of defence and if possible a complete defence of prosperity, is in a general comprehension and unity of action in broad phases of commercial strategy.

There is a steadily growing sense of co-operation in American business—not in restriction of trade—but in a sense of collective thought and action in the broad strategy of employment, production, distribution and credits and of the interdependence of the whole fabric. There is a better understanding of the fundamentals which control the ebb and flow of commerce. The growth of chambers of commerce, of trade associations, of trades unions and other public bodies in their enlarging sense of responsibility, their great development of economic understanding and their enlarged co-operation with governmental agencies in dealing with the larger phases of commerce and credit, is one of the most profound changes in the last decade.

It is a few of these broader problems that I particularly wish to discuss.

We must get our minds away from the notion that pre-war standards of living and volume of business would be normal now. Normalcy is a vastly higher and more comfortable standard than in 1913. We must not judge the state of business activity by pre-war figures, but by a hugely increased base. We must not be frightened when our output of steel or textiles or automobiles, lumber, corn or hogs, or our car loadings amount to figures far in excess of those that would be implied alone in a normal growth of population.

There has been in the past decade an unparalleled growth of our industrial and commercial efficiency and our consequent ability to consume. I do not refer to that growth of productivity which should naturally be expected to accompany the increment of 14 millions in our population during the last decade, nor do I refer to the increase in dollar figures due to higher prices. Entirely over and above these contributions to increased figures, we are producing a larger amount of commodities per capita than ever before in our history. Precise comparisons are difficult to adduce. But exhaustive study from many angles of production over average periods ten years apart, before and since the war, would indicate that while our productivity should have increased about 15 per cent due to the increase in population, yet the actual increase has been from 25 to 30 per cent, indicating an increase in efficiency of somewhere from 10 to 15 per cent.

For example, there has been no increase in the number of our farmers during the last decade, yet the agricultural community not only feeds an increase of 14 millions of population but has increased its average exports from about 7½ million tons to 17½ million tons annually. This would show that the individual farmer has increased his efficiency in production by from 15 to 20 per cent in this period. Increase in production and distribution per person engaged in many other industries can be similarly adduced. There are many commodities where we have years since reached a point of saturation per capita and whose industries grow approximately with the growth of population or increasing exports. There are other commodities where saturation has not been reached. Increasing efficiency not only releases labor and direction for greater production of these things but enables their wider diffusion over the population. A selection of such industries shows a growth of 60 per cent in the last decade.

We have been able to add to our standards of living by the more general distribution of many articles which were either altogether luxuries ten years ago, or which were luxuries to a large portion of the population. Thus

Address before the annual meeting of the United States Chamber of Commerce, New York City, May 8.

an increased proportion of the population is using electric lights, telephones, automobiles and better housing—and has added movies and what not to its daily routine. A rough estimate would show that we could today supply each person the same amount of commodities that he consumed ten years ago, and lay off about 2,000,000 people from work.

Some people have looked upon these additions of new commodities and services in the daily expenditure of our people as representing extravagances, but as a matter of fact they are no entrenchment upon savings. They are the product of better organized effort.

I wish to impress again that I am not confusing the natural increment that would arise from increased population, or not confusing the increased dollar figures due to higher prices but that this is an actual increase of commodities and services per capita in the population. It is due to the increased skill, the advancement of science, to temperance, to the improvement of processes, more labor saving devices—but most of all it is due to the tremendous strides made in industrial administration and commercial organization in the elimination of waste in effort and materials.

Nor has it been accomplished by imposing increased physical effort upon our workers. On the contrary actual physical effort today is less than ten years ago. There has been in this period a definite decrease in the number of hours' work weekly with a definite decrease in physical effort due to improved methods. Nor has it been accomplished by any revolutionary discovery in science.

It is the result of steady improvement in management and method all along the line. It is an accumulation of better practice in the elimination of waste. It is a monument to the directing brains of commerce and industry and the development in intelligence and skill of the American workingman. The result has been a lift in the standard of living to the whole of our people, manual worker and brain worker alike. This is the real index of economic progress.

Building and Construction Industries

I have already referred to our building and construction industries. The construction of our buildings, our railways, our plant and equipment generally, naturally tends to expand parallel with the increased demand for consumable goods because people are both more courageous and more easily financed in good times. We have not only the normal growth of the country to meet, but the long overdue and accumulated deficit. The delays of war and of post-war slump, and our increasing efficiency in production all demand more buildings and transportation facilities.

In addition there is a considerable expansion of Federal, state, and municipal construction. Tax free securities lie at the base of a good deal of this latter. Under these impulses great pressure is being placed upon our material manufacturers and our labor with a consequent tendency to rising costs. I recently made a recommendation that we defer all but the essential Government works and public buildings as much as possible so as to give full swing to private construction. A representative and able commission of business men and labor which I requested to examine this question goes farther and recommends that we should do all our public works in times of depression and thereby provide greater continuity of employment and contribute to plane out the valleys of depression and level the peaks of booms. This deferment of public construction is more important now than ever for we need the full use of labor and material for long overdue private construction. We wish no cessation in this prime necessity. This recommendation received commendation from hundreds of manufacturers, from labor organizations and contractors and the press. The inevitable criticism came from such a minority as to be negligible. Its reception is evidence of the enlightened and constructive thought of our manufacturers who look to the long run of prosperity rather than to the joys of short lived booms. It would be very helpful if such a policy of construction reserve could be well established by states and municipalities as well as the Federal Government.

Gold Accumulations

A development bearing on our credit situation is the large accumulation of gold resulting from our post-war trade balances. Our gold reserve has increased by a billion dollars since the period of maximum credit expansion of 1920, when it stood at about two billions. At that time we possessed a reserve of about 50 per cent against credits and currency, apparently a safe enough margin of gold. This additional billion has not been trenched upon and our present reserves against credit and currency is about 77 per cent. Without most of it we would still be well above the safety line. Some of this new importation yields no return to us either in earnings or in security. It would serve us much better if we were getting returns for it by its export to foreign countries. If it aided in making foreign currencies convertible into gold it would also contribute to stabilize foreign exchange and improve foreign commerce. In fact for us it contains an element of insecurity.

If a castle of credit and currency were created upon the whole of this gold it would mean the greatest era of inflation and speculation in our history. Such action would increase our price levels to a point which would attract foreign goods to us and would curtail our exports. It would thus quickly produce an adverse trade balance and cause this gold to flow abroad with a rush from under our castle of credit and we should have an unparalleled financial crash.

There seems to be heard a sort of chortle in parts of Europe over the commercial strategy in shipping gold to us. It is assumed that we will incorporate this gold into our credit system and be put out of action by the price rises resulting from it. If we retain our normal commercial intelligence this will not happen. I am convinced that the surplus of gold will eventually flow outward in an orderly way through trade without any necessary increase in price levels and its flow need make no disturbance in our business life.

At this point I wish to emphasize the fact that our foreign trade balance sheet does not consist of the movement of commodities alone, but that we must take into consideration in all our conceptions the tremendous importance of the invisible items embraced in the inward and outward flow of capital and interest, shipping charges, remittances by immigrants, tourist expenditures, and a score of other factors. Whereas in 1922 our exports and imports of commodities showed a balance to our credit of about $700,000,000, yet a study by the Department of Commerce indicates that if we would add to the export and import side of the balance sheet the movement of invisible items we would find that the balance turned one or two hundred millions against us even without the gold imports. No one can prophesy for the future but the indications for 1923 make it seem probable that the very considerable increase in imports due to our increased buying power, the probable larger volume of immigrant earnings sent abroad from our large employment, and the increased volume of tourist traffic may again leave us an adverse balance. I believe that in time those adverse balances will begin to force gold from us without the impulse of inflation.

There lies in this situation just one thought. We should mentally earmark a considerable part of our recently acquired gold as temporary and our banking system should safeguard against any entrenchment upon it. Moreover we should look upon gold exports with relief, not with alarm.

Foreign Trade

A further change in our whole economy has been fundamental shifts in our foreign trade. There has been a very large increase in the export of agricultural produce the last ten years which must ultimately be readjusted. I have already said that our actual tonnage of agricultural exports has increased from approximately 7½ million pre-war to an average of about 17½ million tons per annum post-war. We must not disguise from ourselves that the ability of Europe to absorb the bulk of this increase has been due in large measure to the failure of Russia and of the eastern belt of Europe to maintain their production and exports. As these territories become more stable they will enter more sharply into competition. While our manufacturers are dependent upon Europe for a market of only 1 per cent of their output, our farmers now depend upon it as a market for 15 per cent of their production and it is therefore these exports that to a considerable degree determine agricultural price levels.

Agriculture's Future

As Europe gains in stability it will both produce and consume more. Parallel with this our own population will increase. What the final balances to our farmers will be in the action and reaction in this matter no one would prophesy. I have felt that this problem warranted a searching inquiry by an able commission assembled by the Department of Commerce to determine the facts and to suggest policies for the adjustment of our agriculture thereto. The situation among our farmers improved greatly during the past year but not all branches of agriculture have yet caught up with

other industries. It is a truism that we cannot have permanent prosperity without a prosperous agriculture.

Another great shift which has taken place in our foreign trade and which bears on this question is the increase of our imports from tropical countries. These imports now amount to more than one-half of our total imports. We will always be largely dependent on foreign countries for rubber, coffee, tin, and a host of other tropical produce. As we grow in our standards of living and population we will consume an increasing proportion of these products. We must have a consequently increasing volume of imports of this character.

In the long run we should expect a decrease of our exports in agricultural produce and therefore we must increase our exports of manufactured goods if we would maintain our ability to buy tropical and other foreign supplies of vital necessity and at the same time cover tourist expenditures and emigrant remittances. Seventy-five per cent of our exports of manufactures go to destinations outside of Europe and I do not share in the melancholy plaint that we ultimately cannot compete with Europe in neutral markets because of the handicap of our higher standard of living and wages.

Further Increases in National Efficiency

We have gone a long way toward overcoming the so-called handicaps of our higher standards through our great increase in efficiency. Our tremendous domestic market gives us the opportunity for mass production by repetitive methods and enables us to secure low unit costs. That we sell 75 per cent of all the automobiles which move in international trade today and do so at real wages three times those of some of our competitors is proof thereof.

If we would expand our manufactures to replace the inevitable comparative decrease in agricultural produce we shall need to increase still further our industrial and commercial efficiency. We have a large field yet for the elimination of waste, in the still greater improvement and simplification of business methods, in the increase in arbitration of commercial disputes, in the planing out of the business cycle, in the reduction of intermittent operation of industry, in improvements in our internal transportation, in the maintenance of our institutions of economic and scientific research, in the training of technologists, in better commercial strategy and in a score of other directions.

Simplified Practice

I may cite in passing a type of elimination of waste which bears on exports. In the Department of Commerce we have instituted a division of simplified practice working in co-operation with the various industries and your body. The progress of this work has been amazing and I have recently received a statement from one single group estimating that the savings in production cost in that trade already exceed $25,000,000 per annum. Nor does this effort trench upon questions of individuality or quality.

The determination of sizes and grades in paper, textiles, containers, bricks, furniture and in a hundred other products—all contribute to decrease our costs of production and distribution at home and improve our position in competition abroad.

The maintenance of vigorous foreign trade, statistical and information services is likewise of vital assistance to our exporters. That the reorganization of the Department of Commerce in these directions has met with the approval of our business public is, I feel, fully demonstrated by the increase in requests for assistance of one kind or another from an average of a few hundred daily to over 3,000 daily within a period of eighteen months. I do not assume this tremendous addition to our Departmental work would be called for unless it was of real service.

The Railways

One of the great wastes in our economic machine is the shortage of transportation. It is the most profound and far-reaching deterrent upon our growth. It imposes great costs upon production.

I need not point out to you that the periodic car shortage in its real meaning of insufficient tracks and terminals, as well as rolling stock, imposes intermittent stoppages of our industries and intermittent strictures in the law of supply and demand, influences price levels and creates local famines and gluts.

It imposes burdens upon us which I believe every year create commercial losses equal to the entire capital cost of bringing the transportation system up to national need. It would be easy to demonstrate that in the additional price of coal due to insufficient transportation during the past year we have paid more than the equivalent of a 50 per cent increase in freight rate on coal. At times last fall there was a differential of 8 to 15 cents per bushel on export grain solely because of inability to secure free movement to seaboard.

The causes of shortage are not far to seek. While the war contributed much delay and demoralization, the continued strangulation of railroad finances alone, before enactment of the present transportation law, could have brought us only one result.

Nor is this a criticism of the railways for they have grown in detailed working efficiency with the rest of the country. In a decade they have increased the movement of goods by 15 per cent with an increase of 3 per cent in personnel. Moreover the managers are showing great faith and courage in the undertaking of a large program of expansion. It is not my purpose to discuss the ultimate solution of the railway problem here. I have participated with the President of your Chamber in appointing a series of committees comprising representation from the railways, the motor industry, the shippers, the waterways, the farmers and labor. These committees, as you know, are devoting themselves to a full consideration of the complex issues involved and their conclusions will, I believe, be one of the utmost value to the government in advancement of solution.

There is a matter of immediate importance in which the commercial public can be of the utmost assistance in transportation and at once. Pending a large amount of betterments the railways are overtaxed to handle the vast volume of commodities we are producing and consuming even to-day. The continuance of our prosperity depends upon their handling the full load. With the continuation of business volume their burden will be even greater next fall than ever before. Therefore, a great service can be given if every local Chamber will definitely organize to co-operate with every local railway official toward this end. Particularly can the whole community assist if it stocks its coal between now and September so as to relieve the fall and winter traffic. This is equally in the interest of the coal consumer for with the present volume of business and the crop outlook he would be farsighted who emulates the wise virgin and fills his lamp now instead of clamoring at the government when there are not enough cars to go around.

The Coal Industry and Its Problems

There is another direction in which we have great opportunity to improve national economy. That is in the better functioning of our coal industry. If we can reduce the intermittence of operation of the mines and secure their more even seasonal production we shall be eliminating one-third of the capital and labor involved, accomplish three great things of industrial progress: give greater stability to the industry; give better conditions of labor; and reduce costs to the consumer —thereby effecting possible savings running into many hundred millions of dollars. While the solution of the problem will be greatly aided by enlarged transportation facilities, the public can help by co-operation in storage.

General

It is not my intention to discuss with you all our major problems of economic strategy and development. There are great questions of electrification, of waterway improvement, of merchant marine, of the foreign economic situation and our relations to it.

Conclusion

Now all this argument leads me to some general and enlarged conclusions. We have reached a stage of national development of such complexity and interdependence of economic life that we must have a national planning of industry and commerce. We have gained a larger prospective than individual business because individual prosperity is impossible without the prosperity of the whole. This is the function of industry and commerce itself through collective thought. Government has a definite relationship to it, not as an agency for production and distribution of commodities nor as an economic dictator, but as the greatest contributor in the determination of fact and of co-operation with industry and commerce in the solution of its problems. Such strategy in our country must be consummated by frank discussion, by advanced public opinion, and by understanding with a full realization of common goal.

We have in America an economic and social system based on stimulation of individual initiative. Our ideal is to secure and to maintain an equality of opportunity to all. We have honestly sought over years to find methods by which we could curb those who would dominate the community, and thus stifle the initiative and opportunity of

the greater numbers. Nor must we relax vigilance in this particular. But we have also in these times to fight that this initiative shall not be destroyed by those who would divert actual production and distribution into the hands of the Government.

The exact line to be drawn in the curbing of people whose ambition is to interfere with the law of supply and demand to their profit without return of service to the community on the one hand, and the extinction of initiative by the heavy hand of Government on the other is at all times difficult to determine.

Our goal in economic life is to do this great thing, to preserve individual initiative, an equality of opportunity and thus a constantly advancing national standard of living. Our economic and social system is fundamentally right. It has produced the largest advance in the standard of living to the whole of our people that has ever been witnessed in history. Its faults are many but they can, and are being corrected without destroying its progress. It has brought us steady advances despite the fabulous losses of war, and must therefore have great inherent vitality. In short this great conception of America that every man should be given an equality of opportunity to take that position in the community to which he is entitled by virtue of his character and ability, is the keystone of our structure. We must preserve it as the most precious thing we possess, for when all is said and done the finer flowers of civilization do not grow from the cellars of poverty any more than they grow from the palace of extravagance. They grow from the bettering comfort and well-being of the whole of great peoples.

Inspection of Steel is Discussed

At the regular monthly meeting of the New York Chapter of the American Society of Steel Treating held on May 16, Charles McKnight of the International Nickel Co., read an interesting paper on steel inspection which was illustrated with lantern slides and steel specimens taken from the shop.

A general outline of what defects the careful and critical inspector looks for and when and where he looks for them was given. Furthermore, the various methods of testing for these defects were analyzed in detail, showing the limitations of each. Among the inspection tests that steel undergoes in the process of its formation may be mentioned the following: raw material analysis of the metal entering a melt to determine the amount of carbon, sulphur, manganese and other elements; tests undergone by the melt before pouring to determine its composition; heat analysis; surface tests of the cooled ingots after pouring; and lastly the bar mill inspection.

The raw material tests make it possible to get a rough estimate of what is to be the composition of the melt. Among the melt tests are those made during the heat by fracturing small ingots that have been drawn off, and the carbon and manganese analysis made by the laboratory near the end of the heat. In inspecting the cooled ingots after the melt has been poured the following are some of the defects looked for: piping, blow holes, cracks, scabs and segregation. The bar mill inspection consists of upsetting, forging and pickling tests to determine the structure and micrometer tests to determine the size.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.034	$0.0326	$0.0236
Cold finished shafting	per lb.	0.042	0.0406	0.032
Brass rods	per lb.	0.1850	0.1913	0.1466
Solder (½ and ½)	per lb.	0.2862	0.30	0.21
Cotton waste	per lb.	0.1231	0.1231	0.104
Washers, cast iron (⅛ in.)	per 100 lb.	4.66	4.66	4.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	2.96	2.96	3.11
Lard cutting oil	per gal.	0 592	0.575	0 608
Machine oil	per gal.	0.349	0.349	0 40
Belting, leather, medium	off list	42½%	42%	48½%
Machine bolts up to 1 x 30 in.	off list	44¼%	44¼%	62½%

British Machine Tool Exports

In special circular No. 295, the industrial machinery division of the Bureau of Foreign and Domestic Commerce of the Department of Commerce has published statistics on British machine tool exports. The figures on 1921 exports are separated as to countries of destination and similar figures for 1920 are added for purposes of comparison. Details of the 1922 exports by countries of destination are not available, but the total is shown.

The amount of the total machine tool exports of the United Kingdom in 1921 (£2,887,415) exchanged into United States currency at the average annual rate of $3,849,056 is equal to $11,113,822. Total exports of machine tools from the United Kingdom during the year 1922 amounted to £1,530,811. The exports in 1921 showed a decrease of 14 per cent from those of 1920. In 1922 the exports decreased 47 per cent from those of the preceding year. The decrease of 1922 exports compared with those of 1920 (the peak year) was 54 per cent.

Philadelphia Factories Are All Busy

Production of automobile trucks in the Philadelphia district increased fifty per cent in the first three months of this year compared with the corresponding period of 1921. Manufacturers declare at present there is nothing to indicate a reaction.

David S. Ludlum, president of the Auto Car Co., that manufactures a gasoline truck, said the business has been satisfactorily profitable. A similar condition exists in the production of electric trucks. F. E. Whitney, treasurer and general manager of the Commercial Truck Co., said the concern is doing about fifty per cent more business now than it did at this period in 1922. The call seems to be mostly for one and two-ton trucks, Mr. Whitney said.

The varied products of the Link Belt Co. in Philadelphia continue to sell readily. Officials of the company said there is quite a demand for equipment used in the bituminous mines. They believe a reaction from the present volume is possible.

Ventilating equipment has been active this week. Industrial plants are buying freely and hotels and restaurants are increasing their present equipment. Steam and electric shovels were in demand up to May far in excess of any previous period.

Bearing sales have increased in proportion to the use of additional machinery in industrial plants. Agricultural implement manufacture is on the increase, according to reports received this week. Business conditions generally are good in all branches of the industry.

Business Reported Good in Pittsburgh

The steel industry is particularly active all over the country, and especially in the Pittsburgh district, and this means prosperity to the builders of machinery and makers of machine tools. Pittsburgh was never busier in its history. That is the explanation of April's total of $703,725,000 bank clearings at the Pittsburgh Clearing House.

The steel mills are good buyers of machinery parts and machine tools, and shipments have been heavy in the past month, while the railroads are opening up their order books pretty generally, a number of large orders having been recorded by machine tool dealers in this district in the past two weeks. A slight change has come over the labor situation, in that thousands of the men who were expected to desert the mills for outdoor work have so far not indicated any intention of doing so. Consequently, the tin plate, sheet and pipe mills are able to operate close to 90 per cent of capacity. This activity is reflected in the demands for machinery and tools made upon the dealers lately, while the orders coming in from the myriads of auto repair shops and garages that are springing up continually make a splendid aggregate of business for the machine trade. The heavy operating rate at the plant of the Westinghouse Electric & Manufacturing Co. has brought a lot of business in machinery of all descriptions, and while machine tool dealers say they can handle more business than they are doing, nevertheless they see a great improvement over conditions of a year ago.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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TO THE student of business affairs the figures of our foreign trade for March were the sensation of last week. Imports were worth 402 millions, or 61 millions in excess of exports, valued at 341 millions. Both imports and exports are large, but it is the excess of imports that has attracted attention because it is an American tradition that unless we sell more than we buy abroad we cannot be prosperous.

That this is a fallacy for which the extreme protectionists are responsible is proved by the experience of Great Britain whose greatest prosperity has been concurrent with a heavy excess of imports, but time may be required to educate the people of this country to a comprehension of the fact that the United States being a creditor nation can only collect what is due it in goods.

That we would probably have an adverse balance of trade in 1923 and be compelled to export some gold was suggested in these letters some seven weeks ago. It need excite no surprise, nor is it of much importance except as indicating our increased wealth. But as 1873 was the last year in which our imports previously exceeded our exports there is a superstitious fear of such a development that the bears on the Stock Exchange were quick to take advantage of it.

As a result lower prices for some of the more active stocks were recorded early in the week, but when short selling stopped the market became dull and the indications now favor a recovery just as soon as the public begin to understand that there is no more reason for alarm in the fact that Europe happens to be selling us more than we are buying of her than there would be if it became known that the people of New York City were buying more in Michigan than Michigan bought here.

It may be that we will lose some of our surplus gold, but that will not be undesirable as it will allay the fear of inflation here and reveal the absurdity of threatening to advance the rediscount rate when the reserve ratio stands at 75.3 per cent, or nearly twice the legal minimum.

Meantime and probably because of the emphasis latterly laid on everything that could be unfavorably interpreted, the speculative long interest in nearly every market appears to have been liquidated.

It is, of course, true that some one must own the things and the securities that represent the world's wealth, but in so far as America is concerned they seem to have passed into the hands of those who are well able to keep them until they are worth more, and it is for this reason that I am now disposed to expect a gradual, but not an excited, recovery in values.

There are signs of this in the bond market, where the heavy oversubscription to the 400 million of Treasury Certificates offered at 4¾ per cent revealed a plethora of uninvested capital. The railroad shares have also been firmer as car loadings continue heavy and the plans of the Interstate Commerce Commission for consolidating the roads takes shape with less opposition than had been expected.

In the commodity markets the tendency has also been upward. The advances recorded have been attributed to alleged crop impairment, but the truth is the markets were sold out.

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There is a periodicity in the alternation of good and bad crop news as in everything else, and in so far as cotton is concerned it is about time for us to hear again of the labor shortage and the seemingly forgotten boll weevil.

The dry goods market has been somewhat quieter. Wool and woolens have been steady, but cotton goods were a shade easier until the market for the raw material commenced to recover its tone, since when sellers have been stiffer in their demands. The affect is that caution has been preached so widely that there are no surplus stocks of merchandise anywhere. Therefore there is likelihood that the history of 1920 will be repeated for then everyone believed that we were permanently on an altitudinous price level.

Sugar is a shade easier as the United States Agricultural Department has seen fit to slightly increase its estimates of this year's production in the United States and Cuba, but the Cuban planters having sold the bulk of this year's crop are in a position to hold the balance and it is doubtful whether the Government's determination to carry its famous injunction suit to the Supreme Court will have much effect upon prices, which are probably stabilized around 6 cents a pound for raw sugar. The rubber market is a little firmer.

In the building industry there is much talk of curtailment and the abandonment of new construction because of high wages. Much of this is true, but experience suggests a distrust of movements that are so widely advertised. Certainly there is no surplus of skilled labor as yet and the Western papers are filled with advertisements offering employment at high wages to all sorts of mechanics.

Iron is, however, lower; the demand for steel is a little less active and copper is down to 15½ cents. Other building materials are somewhat easier. The declines recorded are presumably due to the reported restriction of building activity. Even if it is as general as claimed it is not to be regretted, for when the demand for farm help and harvest hands begins to be felt there would not have been enough labor to do the work of the United States, and something would have had to stop.

But with things as they are—with everyone busy at good wages and no surplus stocks anywhere—there is no reason for pessimism and many reasons why we may expect good business at gradually advancing prices during the summer.

Conditions abroad are intensely interesting to students of the remoter political future, but they have no fresh economic significance for American business men. Advices from friends who are in Europe or have just returned from there confirm me in the belief that the amount of United States paper money hoarded or in circulation abroad is very large and I shall not be surprised if the total approximates $500,000,000, including the $100,000,000 of Federal Reserve Notes known to be in Cuba and the considerable quantity held in Canada.

Buffalo Markets Show Slight Declines

There are indications in the Buffalo machine tool market of a slackening of business that may or may not be the beginning of a seasonal slump. Some manufacturers and distributors of tools and large and small machines report business is holding up, but others are openly pessimistic and have had a bad two weeks or more. Even among those who report business going ahead, there are some who admit that their business is increasing in the number of orders rather than in volume and, that on the whole, May sales are not as good as those of previous months in the year.

Small tools seem to be most in demand, although certain companies report a falling off even in these lines. There is little demand for large planers and the bigger types of lathes, except in isolated instances. One exception to the rule is a Buffalo distributor who reports the sale of eight large lathes, several punch presses, milling machines and radial drilling machines.

Dealers in pipe fittings, valves, steam fittings and mill supplies reported business fair for some time and improved as Spring arrived.

Contractor's equipment is moving well in the Buffalo market at this time, although the market for large road machinery seems to be somewhat dull.

Automobile Output Still at Record Rate

Reports from automobile and automotive parts manufacturing centers indicate that there will be no let-up in the demand for products and that the figures that will be issued for May will show as large a percentage of gain as any of the months so far this year. All factories are extremely busy and while production has been unusually great, there is every belief that the next few months will prove to be equally as fruitful.

Machine tool builders who sell to automotive plants state that since last Fall the business has been steady and dependable and that the quota of three million cars that has been set for this year will probably be accomplished and perhaps passed.

While much of the output is being used in the United States, there is also noted a big improvement in the shipments to South America and to Canada.

Business Items

The Buffalo Steam Pump Co., Buffalo, has recently opened its foundry in North Tonawanda, N. Y. that has been shut down for nearly two years.

The Rivett Lathe and Grinder Corp., Boston, Mass., has been reorganized with a capitalization of $450,000. The officers are: Thorwald S. Ross, president and general manager, and John G. Coolidge, 2nd, treasurer.

The Charles A. Strelinger Co., Detroit, Mich., has been appointed exclusive agents for the state of Michigan for the J. N. Lapointe Co., New London, Conn.

The New York office of the Whitman & Barnes Manufacturing Co. has been moved to 99 Chambers St., it is announced.

The Niagara Piston Ring Co., Buffalo has moved its offices from 1,387 Niagara St. to 1,170 Main St., Buffalo.

The Midwest Piping & Supply Co., St. Louis, Mo., has increased its capital stock from $300,000 to $500,000, according to reports.

The Ohio Pump & Brass Co., Columbus, Ohio, which has been located at 900 Oak St. for years, has moved into a new plant at Nicholson Ave. and Livingston Ave., which has just been completed.

The Columbia Steel & Shafting Co., Pittsburgh, Pa., has purchased the entire stock of shafting and machinery for the manufacture of the same from the Brightman Manufacturing Co., Columbus, Ohio.

The Gibb Instrument Co. of Bay City, Mich., manufacturer of electric welding equipment, has been appointed distributors of the General Electric Co.'s arc welding electrodes in the Middle West.

The Superior Die, Tool & Machine Co. is the name of a $150,000 corporation chartered by C. A. Field, B. W. Holstein and others to operate the plant at 525 Buttles Ave., Columbus, Ohio, that has been conducted as a partnership by Mr. Field and Mr. Holstein. For the time being no changes will be made to the plant and equipment, but it is planned to expand later on.

Receivers of the Bucyrus Machine & Tool Co., of Bucyrus, Ohio, that failed more than two years ago, have sold the plant to Edwin Hedeen of the Hedeen Motor Sales Co., who expects to get possession within a short time. The building sold for $10,000 and the machinery for $10,000, it is stated.

Obituary

HENRY WOODLAND, secretary and treasurer of the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., and for 21 years a member of its executive staff, was stricken with cerebral hemorrhage early Monday, May 14, and passed away almost immediately. Mr. Woodland was born in Utica, N. Y., and as a youth became connected with the New York Air Brake Co. Later he was transferred to Chicago, and afterward joined the Gates Iron Works, Chicago, as treasurer. This concern in 1901 became a part of the Allis-Chalmers Co., of which corporation Mr. Woodland was made assistant treasurer. Upon the formation of the Allis-Chalmers Manufacturing Co. he was elected treasurer, and more recently was given also the duties of secretary.

WILLIAM N. ANDREWS, vice-president of the Newport Rolling Mills and secretary of the Andrews Steel Co., Newport, Ky., died on May 18 following an operation for appendicitis. Mr. Andrews was one of the best known iron and steel manufacturers in the Middle West.

FRANK E. WING, secretary and treasurer of the L. S. Starrett Tool Co., Athol, Mass., died in his home in that city, May 13. He had been with the concern since 1887. He was also secretary of the Athol Machine Co. of the same city.

Personals

CHARLES T. NEALE has been appointed sales manager for the Buffalo district for the Moltrup Steel Products Co., Beaver Falls, Pa., and will have his office at 303 White Building.

O. M. BOSTWICK, formerly in charge of advertising matters for the Sprague Electric Works, has been put in charge of the New York office of the General Electric Co.'s advertising department.

P. L. HOWENSTINE, Canton, Ohio, was elected to the board of directors of the Superior Sheet Steel Co., at the annual meeting to succeed the late HARRY S. RENKERT. He was made treasurer of the company at the same time.

HARRY C. THOMAS, assistant general manager of the United Alloy Steel Corp., Canton, Ohio, has been elected a vice-president of the corporation.

EARL R. FROST of Tiffin, Ohio, has been elected president of the National Machinery Co. to succeed the late MESHECH FROST, his father. He also has been reappointed general manager of the plant.

A. E. CARLE, machine tools, announces the opening of new offices at 501 Park Ave. Building, Detroit, Mich.

J. W. FELLMUTH, superintendent of the Marion Steam Shovel Co., Marion, Ohio, has resigned to devote his entire time to a newly formed construction company.

J. E. CRAIG, lately superintendent of the Star Drilling Machine Co., Akron, Ohio, for which he had been production manager, has been made sales and production manager of the Cree Becker Oil Tool Co., Newark, Ohio, which recently began reorganization with the election of James E. Cree to the presidency. Craig has been identified with the oil tool machinery business for more than 20 years in sales and production capacities.

CARL MARDERSTECK has been appointed assistant superintendent in charge of the steel barrel department of the Petroleum Iron Works, Masury, Ohio, succeeding JOHN LEHET, resigned.

FRANK C. MILLER, formerly district sales manager for the Brier Hill Steel Co., Youngstown, Ohio, at Detroit, has opened a sales office in that city at 703 Dime Bank Building.

O. C. WHITE, for the past two years Ft. Worth, Texas, manager for the Youngstown Boiler & Tank Co., Youngstown, Ohio, recently was appointed general manager of sales for the company with headquarters in Youngstown. He has been succeeded at Ft. Worth by A. L. SCUDDER.

J. D. WADDELL, president of the Mahoning Valley Steel Co., Niles, Ohio, has resigned his position, although retaining his interest in the company and continuing as a director. J. A. HOSACH, vice-president has assumed charge of the management until the presidency is filled.

CHARLES D. OESTERLEIN, of the Oesterlein Machine Co., Cincinnati, Ohio, will leave shortly for the Far East in an effort to obtain business for Cincinnati machinery houses. He will be accompanied by two engineers and will take with him samples of machine tools and other products of Cincinnati manufacture. After visiting Calcutta and Bombay, Mr. Oesterlein will make a tour of the Orient.

W. G. STEPHENS has been appointed director of the trade school at Stamford, Conn.

C. O. STERNAGLE, formerly connected with the American Bridge Co., Pittsburgh, and more recently with the Colonial Steel Co., as branch manager with headquarters in Chicago, has resigned to go into business for himself in Chicago.

E. P. EVERHARD, for the past six years mill engineer for the Weirton Steel Co., Weirton, W. Va., has been appointed assistant to the president of Freyn, Brassert & Co., Chicago. Prior to his connection with the Weirton company Mr. Everhard was with the Can Sheet Steel Co., the Timken Roller Bearing Co. and the Central Steel Co.

F. J. KELLEY, sales manager for the New Home Sewing Machine Co., Orange, Mass., has been chosen to assist Receiver CHARLES N. STODDARD in reorganizing the business. DAVID S. DRYSDALE, long connected with different sewing machine establishments, has been made superintendent of the plant under the new regime.

E. J. BRYANT will have charge of the gage department of the Greenfield Tap & Die Corp., Greenfield, Mass. He was previously connected with the Taft-Pierce Manufacturing Co., Woonsocket, R. I. and the Brown & Sharpe Co., Providence, R. I. Mr. Bryant has had over twenty years experience in the small tool industry.

P. R. HOOPES has opened offices at 252 Asylum St., Hartford, Conn., as a consulting mechanical engineer. He will specialize in the design of automatic and special machinery and in the development of inventions.

E. J. SKINNER was elected president of the Skinner Chuck Co., New Britain, Conn., at the annual meeting of stockholders recently held. Mr. Skinner was formerly vice-president and general manager.

L. B. AUGUSTINE has been appointed export sales manager of the Wisconsin Electric Co., Racine, Wis. His office will be in Racine.

H. A. SCHULTZ has been appointed advertising manager of the Wisconsin Electric Co., Racine, Wis., it is announced.

A. L. ELLIS has been appointed Eastern representative of the Oilgear Co., Milwaukee, Wis., with headquarters in New York City.

GEORGE MEIER, who was with the Buffalo office of the Fairbanks Co. until its closing recently, has been engaged by Root, Neal & Co. as manager of the machine tool department. They are the representatives in Buffalo now for the Fairbanks Co., it is announced.

DR. SAMUEL W. STRATTON, president of Massachusetts Institute of Technology and former head of the United States Bureau of Standards, addressed the annual meeting of the Engineering Society of western Massachusetts in Springfield, May 15, explaining the importance of scientific standards of weight and measure in manufacturing and business.

LESLIE A. HAMMILL, secretary and treasurer of the Beloit Brass Works, has been elected a member of the common council of Beloit, Wis., to fill the vacancy caused by the resignation of MARTIN B. MACNEILLE, who has been transferred from the Eclipse works of Fairbanks, Morse & Co. at Beloit, to the Three Rivers (Mich.) works, where he will serve as chief engineer of the hydraulic department.

Book Reviews

Elementary Machine Shop Practice. By the Committee on Industrial Education of the National Metal Trades Association. One hundred and eighteen 5½x3¾ in. pages, illustrated. Published by National Metal Trades Association, Chicago, Ill.

The purpose of this book is to assist in the teaching of the machinist trade in connection with the apprenticeship courses carried on by members of the association. As the name implies, it is not intended as an exhaustive treatise, but gives a very brief outline of the work done on the elementary machines, most of the space being devoted to the lathe and planer. The milling machine, however, receives attention in 18 pages, and drilling machines, bench and vise work take up the remainder of the book. The illustrations are all in outline and show cutting tools, the way in which work is held, and other essential details.

Trade Catalogs

Electric Hoists and Auxiliary Mine Equipment. Coeur d'Alene Hardware & Foundry Co., Wallace, Idaho. Bulletin No. 51 showing this company's products has recently been issued. All kinds of electric hoists and controls are described. The booklet contains two perforated leaves upon which prospective customers may list their specific requirements and mail back to the concern for definite information.

Turret Lathes. The Warner & Swasey Co., Cleveland, Ohio. The use of the turret lathe in the glass industry is described in a recent booklet that has been issued by this company.

Bearings and Bushings. The Warner & Swasey Co., Cleveland, Ohio. Various journal bearings are shown in the booklet that has recently been issued by this company. The booklet also contains many diagrams and a wealth of descriptive matter.

Vises. Mantle & Co., New York City. The Mantle vise is illustrated and described in a folder that has been issued by this company in conjunction with Montrose Newman, Inc., sole distributor, New York. The vise is shown in several different positions.

Taps. The Geometric Tool Co., New Haven, Conn. Geometric adjustable collapsing and solid adjustable taps are the subjects treated in a recent catalog that has been issued by this concern. Clear cut photographs of the collapsing taps are used to illustrate the booklet. Specifications and tables are generously used in the text.

Saws. Clemson Bros., Inc., Middletown, N. Y. Saws for all purposes are shown in the recent folder issued by this company. Illustrations and text are both interesting and instructive.

Dust Arresters. The American Foundry Equipment Co., Inc., New York. Knockdown dust arresters and screen arresters are shown in the booklet that this company has recently issued. The efficiency of the product and its effect upon other parts of the factory are pointed out and proved.

Grinding Wheels. The Abrasive Co., Philadelphia, Pa. A handy pocket-sized catalog showing the latest types of "Abrasive" grinding wheels has recently been issued by this company. The catalog shows prices, sizes, methods of use and other valuable data for users of the product.

Boilers. The Lebanon Boiler Works, Lebanon, Pa. The "Uniflow" improved return tubular boilers are well illustrated by photographs and diagrams in a recent catalog that has been issued by this concern. The boiler in the making and in use are illustrated and the booklet also contains many tables.

Motors. The Wagner Electric Corp., St. Louis, Mo. The many advantages of the "Pow-R-full" motors are told in a well illustrated and excellently printed catalog that has recently been issued by this corporation.

Stools and Trucks. The Angle Steel Stool Co., Plainwell, Mich. Stools, chairs, trucks and filing cabinets for office and factory are described in the recently issued catalog of this company.

Material Handling Equipment. The Link-Belt Co., Chicago. The many material carrying and conveying belts and equipment used in foundries are illustrated in the catalog that has just been issued by this company. The catalog is most attractive and the illustrations are to the point and convincing.

Steel. P. F. McDonald & Co., Boston, Mass. A catalog showing the various tool steels and spring steels that are sold by this firm has recently been issued.

Pneumatic Cushions. The Marquette Tool & Manufacturing Co., Chicago, Ill. The use of pneumatic cushions in metal-drawing operations is shown in a recent folder that has been circulated by this company. Diagrams, illustrations and descriptive text make up this interesting folder.

Electric Soldering Irons. The American Electrical Heater Co., Detroit, Mich. An enlarged broadside plentifully illustrated both by drawings and photographs tells the story of the electric soldering irons that are manufactured by this company. The broadside is truly effective.

Micrometer Tools. The E. G. Berg Manufacturing Co., Gardner, Mass. A new catalog showing micrometers, calipers and various kinds of gages has recently been issued by this company.

Electric Hoists and Overhead Traveling Cranes. The Link-Belt Co., Chicago, Ill. How the electric hoist and the overhead traveling crane eliminate trouble out in modern factory are well brought out in the catalog that has recently been issued by this company. The catalog is well illustrated, has many diagrams and tables and convincing text.

Centerless Grinders. The Detroit Machine Tool Co., Detroit, Mich. A four-page folder showing the many features of the No. 4-B centerless grinding machine that is made by this company has recently been issued. Interesting text and valuable information are to be found in the folder.

Molding Machines. The American Foundry Equipment Co., New York. A mailing folder has been issued by this company in which is shown its No. 611 molding machine, assembled and in parts.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Machine tools, automobile accessories, belting, paints and varnishes. Madras, India. Purchase. Reference No. 6373.

Automobile, agricultural machinery, horse clipping machines and sheep-shearing machines. London, England. Agency. Reference No. 6374.

Fire-fighting apparatus and equipment, including three and a half-ton fire engine. Besel, Switzerland. Purchase. Reference No. 6375.

Automobiles and accessories. Budapest, Hungary. Purchase and agency. Reference No. 6376.

Artesian well-drilling equipment and tools, pumps and drilling pipes. Warsaw, Poland. Agency. Reference No. 6383.

Bottling machinery and accessories and machines and equipment for cracker manufacture Turin, Italy. Agency. Reference No. 6385.

Installation for casting of zinc, zinc alloys and aluminum under pressure. Bron, France. Purchase. Reference No. 6387.

Machinery and supplies for confectionery factory. Santiago de los Caballeros Dominican Republic. Catalogs are desired. Reference No. 6388.

Complete plant for bottling wine. Oporto, Portugal. Purchase. Reference No. 6390.

Steel manufacturers, plates, bars, beams and building construction. Karachi, India. Purchase. Reference No. 6397.

Forthcoming Meetings

American Society of Mechanical Engineers. Spring meeting at Montreal, Can., May 28 to 31. Calvin W. Rice, 29 W. 39th St., New York City.

Taylor Society. Meeting at the Hotel Onondaga, Syracuse, N. Y. June 7, 8 and 9.

American Society for Steel Treating. Eastern sectional meeting, Bethlehem, Pa., June 14 and 15. Hotel reservations through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem, Pa.

American Society for Testing Materials. Annual meeting at Atlantic City, June 25 to 29, Chalfonte-Haddon Hall. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Society of Automotive Engineers. Summer Meeting. Spring Lake, N. J., June 19 to 23.

Section V Mechanical of the American Railway Association. Annual meeting at Orchestra Hall, Chicago, June 20, 21 and 22. V. R. Hawthorne, 431 South Dearborn St., Chicago, secretary.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit during the month of September, New Haven, Conn.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Declines—There has been no appreciable decline in the price of steel shapes and plates. Mill quotations, this week, $2.50 per 100 lb. for third quarter deliveries; $2.60 demanded for small shipments in the current quarter. Bars, however, quoted as low as $2.40, Pittsburgh, for delivery in third quarter. Bulk of structural buying at $2.50 base. While no tendency has yet been shown, on the part of buyers, to hold up shipments on orders already placed, the postponement of building projects has had the effect of diminishing the volume of new business at mills. Considerable material, however, is already booked for delivery in the current quarter. Pig iron weaker in the Eastern districts; inquiries for third quarter deliveries reported better in Philadelphia. Black steel sheets down 10c. per 100 lb., f.o.b. Pittsburgh. Tin plates lower at mill. Copper down ⅜c.; tin, 1⅜c. and zinc, ⅛c. per lb. in New York, during week. Lead and tin markets improving, however, and copper inquiries reported better. Fabricated brass and copper down 1c. to 1½c. per lb. in New York market, owing to recent drop in metals.

Advances—Aside from slight firmness in coke, no other advances reported.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	32.27
Southern Ohio No. 2	33.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.94
BIRMINGHAM	
No. 2 Foundry	26.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	32.64
Virginia No. 2	35.17
Basic	31.50
Grey Forge	30 00
CHICAGO	
No. 2 Foundry local	33.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	33.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	31 00
Basic	31 00
Bessemer	31 00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.00
Cleveland	5.60@6.25
Cincinnati	6.75
New York	5.50@5.75
Chicago	4 00@5.00

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00@3.35	4.59	3.90	4.15
No. 12	3.10@3.45	4.64	3.95	4.20
No. 14	3.20@3.55	4.69	4.00	4.25
No. 16	3.40@3.75	4.79	4.10	4.35
Black				
Nos. 17 and 21.	3.70@4.00	4.95	4.55	4.85
Nos. 22 and 24.	3.75@4.05	5.00	4.60	4.85
Nos. 25 and 26.	3.80@4.10	5 05	4.65	4.90
No. 28	3.85@4.15	5.15	4.75	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00@4.50	5.15	4.80	5 10
Nos. 12 and 14.	4.10@4.60	5.25	4 90	5 20
Nos. 17 and 21.	4.40@4.90	5.55	5 20	
Nos. 22 and 24.	4.55@5.05	5.70	5.35	5 65
No. 26	4.70@5.20	5.85	5 60	5 80
No. 28	5.00@5.50	6.15	5.90	6 10

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	62	50½	¾ to 1½	30	13
			LAP WELD		
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
			BUTT WELD, EXTRA STRONG, PLAIN ENDS		
1 to 1½	60	49½	¾ to 1½	30	14
2 to 3	61	50½			
			LAP WELD, EXTRA STRONG, PLAIN ENDS		
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	52%	39%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	49%	36%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 10%. Cast iron, standard sizes, 21½% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5 00	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	7.50@8.00	8.00	7.35
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.30
Cold finished flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.32½
Soft steel bar shapes (base)	3.54	3.36	3.32½
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.71	3.40
Bar iron (3.25 at mill)	3.54	3.36	3.32½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%
Electric welding wire:			
5/32	8.50		14.00
1/8	7.35		12.25
5/32 to 1/4	7.10		11.00

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York		16.12½
Tin, 5-ton lots, New York		43.25
Lead (up to carlots), St. Louis	7.00;	New York, 7.67½
Zinc (up to carlots), St. Louis	6.70;	New York, 7.15

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	30.00	28 50
Antimony (Chinese), ton spot	8.62½	11.00	8.75
Copper sheets, base	26.50	24.25	23.00
Copper wire (l.c.l.)	18.12½	22.00	16.25
Copper bars (l.c.l.)	22.50	25.25	19.50
Copper tubing (l.c.l.)	27.00	30.25	23.00
Brass sheets (l.c.l.)	20 50	25.25	18.75
Brass tubing (l.c.l.)	25.50	30.75	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (l. c. l.)	18.75	21.00	15.75
Brass wire (l. c. l.)	21.00	22.00	.....
Zinc sheets (casks)	11.00	10.40	.....
Solder (⅛ and ¼), (caselots)	31.50@33.50	29.50@31.50	20.00
Babbitt metal (83% tin)	60.00	55.00	41.00
Babbitt metal (35% tin)	35.00	17.50	18.00
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	35 00
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	13.50@14.00	13.50	14 00
Copper, heavy, and wire	13.25@13.75	13.00	13 00
Copper, light, and bottoms	11.25@11.75	11.00	12.00
Lead, heavy	5.00@ 5.50	5 00	6 25
Lead, tea	4.50@ 4.75	4.00	5.25
Brass, heavy, yellow	7.50@ 7.75	....	8.50
Brass, heavy, red	11.00@11.50	11.00	10.50
Brass, light	6.00@ 6.50	6 00	7 00
No. 1 yellow brass turnings	7.50@ 7.75	7.50	7.75
Zinc	3.75@ 4.25	4.00	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	23 50	19.50	18.50
IX,	20x28, 112 sheets	26.00	22.25	20.90
"A" Grade:				
IC,	20x28, 112 sheets	21 00	17.00	17.00
IX,	20x28, 112 sheets	23.50	19.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	13.00	12.60	14.50
IC,	112 sheets	13.30	13.00	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.65	7.25
IC,	14x20	7.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11½
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13½x13½, per lb.	11.25	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	3.50	2.65
Roll sulphur, per 100 lb.	2.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.16	1.33	1 37
White lead, dry or in oil	100 lb. kegs.	New York,	14.50
Red lead, dry	100 lb. kegs.	New York,	14.50
Red lead, in oil	100 lb. kegs.	New York,	16.00
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		$4.50@6.00
Coke, prompt foundry, Connellsville	per net ton		6.00@7.00

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1⅛ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 5/16 and smaller	60%	.....	...
Semi-finished nuts, ⅜ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2 75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	40%	50-10%	50%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3 90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0 15	.....	0.15
½ in. diameter *EXTRA*	0 50	.....	0.50
1 in. long, and shorter *EXTRA*	0 50	.....	0.50
Longer than 5 in. *EXTRA*	0 25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.60	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3 20

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—C. Trohs, Jr., 2301 South La Salle St. (machine shop)—engine lathe, 6 ft. swing over carriage, 24 ft. between face plate and tailstock.

Kan., Benton—L. D. Gragg (blacksmith)—power drill press.

Kan., Eldorado—De Long Garage—power drill press, metal lathe, belting and hangers (used).

Kan., Eldorado—L. J. Egan, 306 South Main St.—tinner's brake and other tinsmith tools (used).

Kan., Eldorado—Eldorado Auto Salvage Co., Beinaghs & Neelys, Purch. Agts.—power drill press and lathe.

Kan., Eldorado—Greiner's Garage, 418 South Main St.—power cylinder grinder (used preferred).

Kan., Eldorado—Gruman-Rayl Constr. Co., 717 West Carr Ave. (machine shop), J. Rayl, Purch. Agt.—power drill press, 16 in. lathe for metal work, keyseater, belting, hangers and pulleys (used).

Kan., Eldorado—C. W. Hurtger, 113 East Locust St. (machine and blacksmith shop)—power lathe, 11 in.; power drill press.

Kan., Eldorado—T. J. Kallauner, Ramsey Garage, 213 North Main St.—power cylinder grinder, lathe and drill press (used).

Kan., Eldorado—Part Front Garage, 202 West Ash Ave., W. F. Opperman, Purch. Agt.—power cylinder grinder for automobile work and power drill press.

Kan., Eldorado—Peoples Supply Co., 111 West Locust St., (garage and machine shop), W. G. Covert, Purch. Agt.—power lathe.

Kan., Eldorado—C. W. Robinson, 330 North Main St. (oil)—power lathe.

Kan., Eureka—R. I. Frost (garage and blacksmith shop)—power cylinder grinder, power lathe, power drill press, emery stand, hangers, belting, pulleys, shafting, bearings, blacksmith anvil, machinist's and blacksmith's hand tools, welding outfit, also tire repair machine.

Md., Baltimore—Harvey Co., 113 South St. (machinery dealers), A. Harvey, Purch. Agt.—36 in. single punch to punch 1 in. holes through ¾ in. thickness.

Mass., Boston—Keystone Mfg. Co., 53 Wareham St. (manufacturer of toys)—two power presses with 2½ or 3 in. stroke, No. 5 Consolidated preferred (used).

Mass., Taunton — Magee Furnace Co. (manufacturer of stoves, ranges and furnaces)—power pipe cutter to cut larger sizes of pipe, also pipe threading machine (used).

N. Y., Buffalo—F. Gale, 425 Baynes St.—garage and repair shop equipment, also gasoline service station equipment.

N. Y., Elmira — Bolton Garage, East Market St.—complete garage and repair shop machinery, tools and equipment.

N. Y., Henderson Harbor—F. L. Jones Co. (dairy products)—one 1½ and one 2 ton triple chain hoists; one power grinder (grindstone for agricultural implements).

N. Y., Lake Placid—Pierce & Disco (machine shop and garage), C. W. Disco, Purch. Agt.—lathe and shaper for motor repair.

N. Y., New York—Natl. Crushed Stone Co., 728 River Ave.—carboratum lathe machine, polishing machine and planer.

N. Y., New York—E. G. Woolfolk & Co., 15 West 38th St.—Saunder 8 or 10 in. pipe machine with motor attached.

O., Cleveland—New York, Chicago & St. Louis R.R. Co., Columbia Bldg., W. P. Dittoe, Purch. Agt.—one 42 in heavy duty vertical boring and turning machine; one 24 in. shaper.

O., Columbus—Columbus White Motor Truck Co., Central Natl. Bank Bldg., C. J. Bassett, Mgr.—one 24 in. lathe and one milling machine for new service station.

O., Columbus—Ohio Chandelier Co., 311 West Broad St., G. Clarke, Pres.—metal working machinery.

O., Columbus—Okey Mfg. Co., Naghten and Water Sts. (general machine and tool work), P. Okey, Mgr.—equipment to enlarge shop, including small lathe and grinder.

Okla., Enid—Franks Machine Shope, 219 East Randolph St.—one 14 in. x 14 ft. lathe, taper attachment, quick change gear; Heald cylinder regrinder; one high speed hacksaw.

Okla., Enid—Kingham Machine Shop, 420 South Independence Ave.—one 2 x 3 Universal Cincinnati milling machine, one 24 x 24 x 6 or 8 planer and one 12 or 14 in. swing Universal or plain cylindrical grinder.

Pa., Mansfield—S. B. Bishop—machine shop equipment, including drill, press, punch, etc.

Wis., Cambridge—A. Kravick—automobile repair machinery, gasoline tanks and pumps, also small tools for proposed garage and filling station.

Wis., Chippewa Falls—A. P. Hauptmann, 16 West Willow St.—automobile repair machinery; drill press; blacksmith shop equipment, including forge and small tools.

Wis., Kenosha—Mantkus Motor Sales Co., 313 Park St.—automobile repair machinery for proposed garage.

Wis., Milwaukee — Reliance Auto Parts Co. 11th and Prairie Sts. I. H. Bierman Purch. Agt.—medium size drill press (used preferred).

Wis., Plymouth — Badger State Service Co.—automobile repair machinery, gasoline storage tanks and pumps for proposed $40,000 garage.

Wis., Port Washington—Schmidt Bros. Co.—automobile repair machinery, drill press, gasoline tanks and pumps, also small tools for proposed garage and service station.

Wis., Racine—N. Johnson, 1302 Washington Ave.—machinery and equipment for the manufacture of aluminum rims for bicycles, including rolling and welding machinery.

Wis., Sherry — **A.** Schwetz—automobile repair machinery, press and small tools for proposed garage.

Wis., Sturgeon Bay—Lake Shore Motor Co., H. W. Ullperger, Purch. Agt.—automobile repair machinery, drill press and free air equipment for proposed garage and repair shop.

Ont., Toronto—Toronto Transportation Comn., 35 Yonge St., H. H. Couzens, Mgr.—receiving bids until May 31 for electrically operated equipment, including machine lathes, several sizes; drills; shapers; milling machines; grinders; furnaces; forges; hoists; air hammers; lift trucks; time clocks; jib cranes, 1 ton up; car hoists; tools; shears for car repair shops on Bathurst St. and Davenport Rd.

Que., Montreal—Canada Metal Co., Ltd., 3050 Hutcheson St., D. R. Scott, Purch. Agt.—sheet metal working equipment.

Que., Montreal—J. K. MacDonald Estate, 32 St. Alexander St.—additional machine shop equipment.

Que., Montreal—Wilson Machine Co., Ltd., 135 Nazereth St., M. Wilson, Purch Agt.—machine shop equipment.

Machinery Wanted

Ala., Alexander City—Avondale Mills—textile machinery, including looms and about 27,000 spindles.

Ala., Tuscaloosa—J. G. Foster, Pres.—complete brick making machinery and equipment.

Ark., Blytheville — Wagoner-Gage Co. (cotton oil products)—machinery and equipment, including cotton presses for $250,000 plant.

Ark., Van Buren—H. C. Rains—brick making machinery.

Calif., Fresno—Bd. Educ., L. L. Smith, Secy.—receiving bids until June 28 for one Crescent No. 55 Universal woodworker or equal with equipment.

Calif., Los Angeles—J. A. Scott, 1448 South San Pedro St.—prices and catalogues of complete plant equipment for the manufacture of bronze bushings of all sizes and types.

Calif., Placienta—Placienta Orange Growers' Assn.—machinery and equipment for two ice manufacturing plants.

Conn., New Britain—State Trade School, H. S. Hall, Dir. Com.—general small machines, including drills, small lathes, reamers, etc.

D. C., Wash.—A. L. Flint, Genl. Purch. Officer of the Panama Canal—receiving bids until May 28 for forges, grindstones, anchors and grommets.

Fla., Gainesville—Mechanical Arts Dept., University of Florida—foundry and forging equipment, including electric and hot-flame welding apparatus. Send catalogs.

Fla., Tampa—Tampa Bay Fertilizer Co., S. W. Allen, Pres.—machinery and equipment, including grinding and pulverizing machinery, for the manufacture of fertilizer.

Ill., Chicago — Elgin, Joliet & Eastern R.R., 208 South La Salle St., C. H. Kenzel, Purch. Agt.—1½ cu.yd. electric bucket crane.

Ind., Hartford—Hartford Fdry. Co.—additional foundry equipment.

Kan., Eldorado—D. L. Corley, 135 North Main St.—power leather stitcher.

Kan., Eldorado—E. Darado, 219 East Central St. (cabinet maker)—power Universal saw, scroll saw and wood lathe.

Kan., Eldorado—Eldorado Carpenter & Cabinet Shop, 208 South Vine St.—power automatic wood lathes, belt sander and rip saw.

Kan., Eldorado—Harlan Print Shop, 108½ West Central Ave., M. Harlan, Purch. Agt.—power job printing press and Miller feeder (used).

Kan., Eldorado—The Met-L-Woodcraft, 112 East Locust St.—small power wood lathe.

Kan., Eldorado—Rodwell Shoe Shop, 2nd and Main St., M. Rodwell, Purch. Agt.—power stitcher and finisher for leather work.

Kan., Eldorado—E. Smith, 507 North Main St. (shoe repair) leather stitcher with electric power attachment.

Kan., Eldorado—Snyder Ice Cream Co., 4th St., W. J. Simmons, Purch. Agt.—belting, hangers, pulleys, shafting and bearings for ice factory.

Kan., Towanda—Towanda *Times*, O. T. Tedrick, Purch. Agt.—power job press and power paper cutter (used).

Kan., Winfield—Stewart & Wheeler—air compressor outfit for garage, also rubber vulcanizer.

Ky., Lancaster—Kentucky Utilities Co., M. E. Taylor Bldg.—electrically operated ice plant machinery and equipment, capacity 20 ton per day.

Ky., Louisville—Downard-Manning Coal Co., 1024 Inter-Southern Bldg.—$50,000 worth of electrical equipment and mining machinery.

Ky., Louisville — Louisville Textile Co., 309 9th St.—textile machinery for proposed $25,000 factory.

Md., Baltimore—Wyatt Rubber & Chemical Co., 780 North Eutaw St., C. M. Wyatt, Purch. Agt.—machine to fill small cans with stiff rubber putty, machine to fill collapsible tubes with semi-stiff putty and machine to fill tubes with pastes and glues.

Md., Havre de Grace—Bd. Educ.—complete vocational equipment for $150,000 school.

Mass., Marlboro — Chairman of School Com.—machinery for manual training department of new high school.

Mass., Ware—Chairman of School Com.—machinery for manual training department of high school.

Mich., Detroit—Pittsman & Dean Co., 1255 Griswold St.—miscellaneous equipment, piping, etc., for proposed $50,000 ice plant.

Mich., Lansing—Michigan Butter & Egg Co., 701 East Kalamazoo St.—cold storage equipment for proposed $50,000 plant.

Mich., Palmer—School Bd., L. Anderson, Clk.—manual training machinery, including lathe, mortiser and bandsaw.

N. H., Newmarket—Newmarket Mfg. Co., address Purchasing Agent—several hundred spindles and several looms for branch cotton mill at Lowell, Mass.

N. J., Waldwick—Waldwick Coal & Lumber Co.—machinery and equipment for lumber mill, to replace that which was destroyed by fire.

N. Y., Buffalo—J. J. Geigand, 346 Herman St.—equipment, one 2,000 gal. gasoline tank and pump for station at 816 Genesee St.

N. Y., Buffalo—R. Gray, 135 Dart St.—one tumbling barrel.

N. Y., Buffalo—E. E. Harris & Co., 22 Maurice St.—equipment, also one 1,000 gal. gasoline tank and pump for service station on Ohio and Washington Sts.

N. Y., Buffalo—Iroquois Candy Co., 655 Bway, A. A. Freund, Pres.—equipment for plant for the manufacture of confectionery at 78 Bway.

N. Y., Corning—Roulette Glass Co., G. S. Goff, Pres.—glass blowing machinery and equipment for plant for the manufacture of vacuum bottles, etc., at Roulette, Pa.

N. Y., Elmira—Campbell Knitting Mills, East Ave., M. Fitzgerald, Mgr.—knitting machines and mill equipment.

N. Y., Geneva—Geneva Glass Products Co., Ave. F—glass making machinery and equipment for plant for the manufacture of general glass products.

N. Y., Haverstraw—Bd. Educ.—vocational equipment for $150,000 school.

N. Y., New York—Atlantic Enameling & Japanning Co., 398 1st Ave.—one gas oven.

N. Y., Prattsburg—Bd. Educ.—vocational equipment, including saws, press, drill, etc., for $90,000 school.

N. Y., Victor—Bd. Educ.—complete vocational equipment for $200,00 school.

N. Y., Watertown—C. E. Palmiler Co., Winthrop St.—5 x 8 in. power operated job printing press.

N. Y., Yonkers—Bd. Educ.—vocational equipment for $125,000 addition to trade school.

N. C., Lenoir—Caldwell Cotton Mills—6,000 looms, 3,000 twister spindles and other machinery and equipment for cotton spinning plant.

N. C., Seagrove—Lucas Lumber Co.—complete machinery and equipment for several proposed sawmills.

O., Columbus—Elkland Coal Mining Co., 510 Schultz Bldg., D. C. Hitt, Pres.—shaker screens and scales for plant at Elkhurst, W. Va.

O., South Columbus (Columbus, P. O.)—Buckeye Stamping Co., Warren Rd. (tin boxes and cans), E. C. Derby, Pres.—additional machinery for factory.

Okla., Tulsa—M. M. Allton, 621½ South Boulder St.—belting hangers, pulleys, bearings and power machinery for cleaning plant (used preferred).

Pa., Allentown—Rittersville Coal & Iron Co., East End—lumber yard and mill machinery.

Pa., Butler—Eagle Printing Co.—printing plant machinery, including presses, typesetting machines, etc., also transmission and conveying machinery.

Pa., East Fayetteville (Fayetteville, P. O.)—East Fayetteville Grain & Feed Co.—planing mill machinery and equipment, including grinders, sackers, etc.

Pa., Grove City—Bessemer Gas Engine Co., J. Carruthers, Pres.—foundry and paint shop machinery.

Pa., Hazleton—Worthington Pump Co., W. Goodman, Vice-Pres.—machinery and equipment for plant for the manufacture of motor cars.

Pa., Pittsburgh—H. R. Eicher, 608 Maloney Bldg. (machinery broker)—15 ton locomotive crane with 70 to 80 ft. boom with device for raising and lowering boom.

Pa., Reading—S. Brown-Sailor Underwear Co.—complete machinery and equipment for factory, to replace that which was destroyed by fire.

Pa., Salemville—Keystone Coal & Coke Co.—washing, screening, conveying and coking machinery and equipment for proposed $100,000 washery and coking plant, to replace that which was destroyed by fire.

Pa., Scranton—Infant Wear Co., Inc., 1821 North Main Ave.—knitting machinery and equipment, etc., for the manufacture of infants' clothing.

Pa., Slatington—Amer. Slate Co.—slate making machinery and equipment for proposed $100,000 mill, to replace that which was destroyed by fire.

Pa., Snydertown—Plymouth Anthracite Coal Co.—washing, screening and conveying machinery for proposed $100,000 coal washery.

Pa., Susquehanna—Susquehanna Silk Mill—silk mill machinery and equipment, including looms, etc.

S. C., Marion — Bd. Educ. — vocational equipment for $100,000 school.

Tenn., Smyrna—J. S. Young—machinery and equipment, including saws and conveying machinery, for several proposed sawmills near Demopolis, Ala.

Tex., Waco—C. O. Walther, 1114 North 12th St. (job printer)—power ruling machine and two beam automatic striper.

Va., Pulaski—Coleman-Vaughn Furniture Co.—machinery for proposed factory.

W. Va., Morgantown—Athens Glass Wks.—glass working and sand blowing machinery for branch plant at Ada, Okla.

W. Va., Nitro—Fuller Container Co.—special machinery and equipment for $500,000 plant for the manufacture of patented process battery containers.

Wis., Antigo—Antigo Canning Co.—canning machinery and gravity conveyors for proposed $40,000 canning plant.

Wis., Eau Claire — Wisconsin Grain & Cereal Co., 408 Eau Claire St., H. F. Wright, Mgr.—grinding machinery, cutters, belting and shafting, to replace that which was destroyed by fire.

Wis., Greenwood—C. Kupkill—gasoline and oil storage tanks and pumps for proposed filling station.

Wis., La Crosse — F. W. Techmer, 1243 Jackson St.—laundry machinery, including manglers, washers, etc.; also water softening apparatus.

Wis., Madison—A. Fiore Co., 620 West Mifflin St.—free air equipment, gasoline tanks and pumps, etc., for proposed service and filling station.

Wis., Madison—R. A. Phillips, Archt., Beaver Bldg.—refrigerating machinery and 20 ton ice machine for proposed cold storage plant.

Wis., Madison—Piper Bros. Grocery Co., 31 North Pinckney St.—refrigeration equipment, ice machines and conveyors for proposed store.

Wis., Madison—Wiedenbeck-Doblein Co., 601 West Mifflin St.—gasoline storage tanks and pumps for proposed $40,000 garage.

Wis., Menosha—Nicolet Knitting Co., c/o J. G. Walter, 300 Nicolet Blvd.—automatic knitting machines, loopers, etc., for the manufacture of knit goods.

Wis., Milwaukee—Builders' Millwork Co., 1040 30th St.—one sticker, about 3 in.

Wis., Milwaukee — Degentesh Bros. Co., 28th St. and Forest Home Ave. (fuel, etc.)—coal crane and conveyors, several ton capacity.

Wis., Milwaukee—G. M. Co., 1160 47th St. (woodwork)—cutoff saw, about 5 ft.

Wis., Milwaukee — Milwaukee Vinegar Co., 79 Buffalo St.—special mechanical extracting and drying equipment for proposed $60,000 dry house at Cudahy.

Wis., Milwaukee—Pittsburgh Plate Glass Co., 205 Lake St.—special paint and varnish making equipment and conveyors.

Wis., Milwaukee—A. L. Richards, 90 Mason St.—gasoline storage tanks, pumps and air compressor for proposed $160,000 garage.

Wis., Milwaukee—Texkraft Co., c/o O. J. Wittig, 807 Wentworth Ave. (manufacturer of knit goods)—textile machinery, including looms, loopers, shuttles, etc.

Wis., Milwaukee—S. J. Zimmer Co., 521 9th Ave.—woodworking machinery, including rip saw, medium size planer and about 6 in. joiner.

Wis., Racine—C. S. Anderson, 1500 Kewaunee St.—series of core ovens and pouring ladles.

Wis., Sheboygan—S. & D. Hanger & Panel Co., 722 Jefferson Ave., H. Davis, Mgr.—woodworking machinery, glue pots and special panel machinery.

Wis., Sheboygan — Wadhams Oil Co., Michigan Ave. and 13th St.—gasoline storage tanks and pumps, free air equipment, etc. for proposed service and filling station.

Wis., Stevens Point—Journal Printing Co. 114 North 3rd St.—additional presses and paper cutter.

Wis., Withee—A. Claviter—gasoline storage tanks and pumps, free air equipment, etc., for proposed filling station.

Ont., London—Reid Bros., 391 Clarence St.—machinery and equipment for the manufacture of stationery.

Ont., Ottawa—City, N. H. H. Lett, Clk., City Hall—three large and three small jack hammers; one small and one large portable air compressor; one cement gun; coal oil tool heater; auto hoist for garage; continental axle stand; gauge testing machine for garage; power hammer, tire bender and one set micrometers for machine shop; auger machine for wood shop.

Ont., Toronto—A. Weller & Co., 54 Tecumseh St.—woodworking equipment for proposed planing mill, to replace that which was destroyed by fire.

Ont., Wroxeter — Bainton Bros. — complete machinery and equipment for woolen mills, to replace that which was destroyed by fire.

Que., Montreal—Cambridge Press Ltd., 321 Bleury St.—presses.

Que., Montreal—Federal Iron Wks., Ltd., 1112 St. Patrick St.—machinery and equipment for the manufacture of steel lavatory partitions.

Que., Montreal—L. Villeneuve & Co., Ltd., 2588 St. Lawrence St. (lumber and millwork), J. Dupre, Secy.—additional sawmill equipment.

Metal Working Shops

Calif., Oakland — Oakland Refrigerator and Butchers Supply Co., 2766 Grove St., has had plans prepared for the construction of a 1 story, factory, on 12th St. Estimated cost $40,000. A. W. Smith, 1010 Bway., Archt.

Calif., San Francisco — The Northwest Lead Co., 1742 4th St., South, Seattle, Wash., manufacturer of lead pipe, sheet lead and plumbers' supplies, plans to build a fabricating plant, here. Cost will exceed $300,000. F. W. Bradley, Crocker Bldg., San Francisco, Pres

Conn., Bridgeport—The A. L. Clark Co., 1490 Main St., plans to build a garage, show room and service station on Fairfield Ave. Estimated cost $150,000. Engineer or architect not selected.

Conn., Hartford — The Brown-Thomson Co., Main St., awarded the contract for the construction of an 80 x 100 ft. garage. Estimated cost $40,000. Noted May 10.

Conn., Hartford—The Standard Oil Co. of New York, Wawarme Ave., awarded the contract for the construction of a 1 story 40 x 120 ft. garage. Estimated cost $45,000.

Conn., Middletown — R. W. Magnano, Spring St., awarded the contract for the construction of a 1 story, 50 x 70 ft. garage. Estimated cost $40,000.

Ill., Chicago.—The Midway Corp., c/o A. S. Alschuler, Archt., 28 East Jackson St., awarded the contract for the construction of a 1 and 2 story, 125 x 148 ft. automobile sales and service station on Cottage Grove Ave. and 60th St. Estimated cost $175,000.

Ill., Chicago—The Walker Vehicle Co., 8700 South State St., awarded the contract for the construction of a 1 story, 67 x 352 ft. factory at 1-57 West 87th St. Estimated cost $100,000.

Ky., Central City — The Barnes Auto Co., Inc., awarded the contract for the construction of a garage. Estimated cost $40,000. Noted Apr. 12.

Me., South Portland—The Maine Central R. R., Portland, awarded the contract for the construction of locomotive and car repair shops, etc., here. Estimated cost $1,250,000. Noted Jan. 25.

Md., Baltimore—The Motor Finance Co., Inc., 15 Mt. Royal Ave., plans to build a 1 and 2 story garage on Fulton St. and Pennsylvania Ave. Estimated cost $75,000. R. M. Stein, Pres. Engineer or architect not selected.

Mass., Lowell—Lockwood, Greene & Co., Engrs., 24 Federal St., Boston, are receiving bids for the construction of a 40 x 100 ft. forge shop with connecting bridges and service equipment for the Saco-Lowell Shops, Dutton St., here. Noted Apr. 19.

Mich., Detroit—H. J. Farwell, Archt., 35 Ford Ave., Highland Park, is receiving bids and will open same about May 26 for the construction of a 3 story, 40 x 125 ft. garage and service station on Hamilton Blvd., here, for Kohn & Michelson, 13806 Woodward Ave. Estimated cost $50,000.

Mich., Detroit—The C. M. Hall Lamp Co., 1035 East Hancock Ave., is having plans prepared for the construction of a 2 story, 80 x 172 ft. addition to its lamp factory. Estimated cost $75,000. Baxter, O'Dell & Halpin, 1024 Hammond Bldg., Detroit, Archts.

Mich., Detroit—The Hupp Motor Car Co., 3501 East Milwaukee St., awarded the contract for the construction of a 120 x 504 ft. stamping plant, including loading docks, tunnel, one 5 ton, one 10 ton, and one 25 ton crane, etc. on Mt. Elliott Ave. Estimated cost $500,000.

Mich., Detroit—The J. W. Murray Mfg. Co., Clay Ave. along tracks of Grand Trunk Ry., awarded the contract for the construction of a 1 story, 70 x 108 ft. addition to automobile fender factory on Marston Ave. Estimated cost $25,000.

Mo., St. Louis—The Columbia Can Co., 128 Madison St., awarded the contract for the construction of a 2 and 3 story, 265 x 345 ft. can factory on Natural Bridge Rd. Estimated cost $500,000.

Mo., St. Louis—The Trade Realty & Investment Co., La Salle Bldg., has purchased site and plans to build a 3 story 100 x 125 ft. automobile show room and garage on Washington Ave. Estimated cost $125,000. Engineer or architect not announced. Owen-Baskett Co., 3339 Locust St., lessee.

N. Y., Brooklyn—J. Dinowitz, c/o E. M. Adelsohn, Engr. and Archt., 1778 Pitkin Ave., will build a 1 story garage on St. Marks Ave. Estimated cost $50,000.

N. Y., Canisteo—The Canisteo Iron Wks. will rebuild the portion of its plant, which was recently destroyed by fire. Loss $15,000. W. D. Carter, Depot St., Mgr.

N. Y., Saratoga Springs—The Baker Mfg. Corp. plans to build additions to its foundry and machine shop. Cost between $100,000 and $125,000. J. T. Loree, Genl. Mgr.

N. Y., Watertown—The Standard Oil Co. of New York, 26 Bway, New York, has purchased site and plans to build an oil and gasoline filling station, garage and service station at 410 State St., here. Estimated cost $50,000.

N. C., High Point—The Lucas Lumber Co. plans to build a machine shop, power house and mill. Estimated cost $250,000. Engineer or architect not selected.

O., Canton—The Union Metal Mfg. Co., 1410 Maple Ave., N.E., plans to build a large addition to its plant. Estimated cost $120,000. Engineer or architect not announced.

O., Cleveland—L. D. Round, Stop 3, A. B. C. Line, awarded the contract for the construction of a 1 story, 54 x 88 x 134 ft. garage on Bway and Round Ave. Estimated cost $50,000.

O., Cleveland—B. J. Russell, 10539 Euclid Ave., has had plans prepared for the construction of a 1 story, 90 x 115 ft. garage on East 22nd St. and Marion Ave. Estimated cost $40,000. G. A. Grieble Co., Sloan Bldg., Cleveland, Archts.

O., Mingo Junction—The Pennsylvania R.R. Co., Pennsylvania Sta., Pittsburgh, is having plans prepared for the construction of additions to yard and shops, also a 1 story machine, work shop and oil works, here. Estimated cost $500,000. W. D. Wiggins, Ch. Engr.

Pa., Bedford—The Gulf Refining Co., has purchased site and plans to build a 1 story, 60 x 240 ft. oil and gasoline station and garage on West Pitt St. Estimated cost $60,000.

Pa., Grove City—The Bessemer Gas Engine Co. will build two 1 story additions to its plant, consisting of an 80 x 180 ft. foundry and paint shop and a 76 x 180 ft. storage building. J. Carruthers, Pres.

Pa., Latrobe—The Ry. Steel Spring Co., 30 Church St., New York City, is receiving bids for the construction of a 1 story, 178 x 1,000 ft. machine shop and manufacturing plant, here. Estimated cost $300,000. Private plans.

Pa., Pittsburgh—C. G. Hussey & Co., 2850 2nd Ave., awarded the contract for the construction of a 3 story and basement (ultimately 7 story), 80 x 220 ft. brass factory on 2nd Ave. Estimated cost $250,000. Private plans.

Pa., Pittsburgh—J. McSorley, 5526 Hobart St., will build 2 story and basement, 80 x 100 ft. garage on Millwood and Center Sts. Estimated cost $40,000. Private plans.

Pa., Pittsburgh—B. H. Prack, Archt., Keystone Bldg., is receiving bids for the construction of a 4 story and basement, 62 x 143 ft. factory on Braddock Ave. for Mine Safety Appliance Co., Chamber of Commerce Bldg. Estimated cost $150,000.

Pa., Pittsburgh—R. M. Trimble, Archt., Ferguson Bldg., is receiving bids for the construction of a 3 story and basement, 30 x 111 ft. machine shop on Reedsdale St., for Martin Hardsogg Co., 916 South Ave.

Pa., Scranton—J. Notarinna and P. Battista, Wyoming Ave., awarded the contract for the construction of a 1 story, 80 x 150 ft. garage on Wyoming Ave. Estimated cost $60,000.

Pa., Scranton—H. G. and W. A. Smith, Wyoming Ave. and Walnut St., are having plans prepared for the construction of a 87 x 155 ft. plant for the manufacture of auto spring wheels and bodies, Wyoming Ave. Estimated cost $60,000. Engineer and architect not announced.

Pa., Smethport — The Smethport Garage Co. is having plans prepared by S. T. Graham, Archt., 301 Jackson Ave., Bradford, for a 2 story and basement, 54 x 120 ft. and 30 x 54 ft. garage. Estimated cost $40,000.

Pa., Wilkinsburgh (Pittsburgh, P. O.)—H. R. Heller, 231 South Euclid Ave., Pittsburgh, awarded the contract for the construction of a 1 story, 60 x 80 x 100 ft. garage on Johnston St., here. Estimated cost $40,000. Noted Apr. 26.

R. I., Providence—S. Bomes, 60 Dorrance St., will build a 1 story, 100 x 100 ft. garage and service station on Warrenton St. and Elmwood Ave. Estimated cost $40,000. Noted Mar. 22.

R. I., Providence—S. Priest, c/o Superior Printing & Finishing Co., Bellefont (Providence, P. O.), plans to build a 1 story, 150 x 285 ft. garage and service station on Elmwood Ave., here. Estimated cost $150,000. Engineer or architect not selected.

R. I., Providence—E. Radding, 144 Westminster St., is having plans prepared for the construction of a 2 story garage and service station on North Main, Frost and Nashua Sts. Estimated cost $75,000. B. S. D. Martin, 36 Weybosset St., Providence, Archt.

R. I., Providence — The What Cheer Stables Co., Benefit and Meeting Sts., plans to build an addition to its garage and automobile repair shop. Estimated cost $75,000. Engineer or architect not announced.

S. C., Union—Flexible Saw Wks. plans to build a factory. Estimated cost $90,000. Engineer and architect not announced.

Tenn., Etowah—The Louisville & Nashville Ry., 10th St. and Bway., Louisville, Ky., is having plans prepared for the construction of a machine shop, here. Cost will exceed $25,000. G. R. Smiley, Ch. Engr.

Tenn., Memphis—H. H. Roth Co., 1035 Union St., awarded the contract for the construction of a 5 story, 74 x 146 ft. garage on 3rd and Union Sts. Estimated cost $125,000.

W. Va., Clarksburg—Clarksburg Automobile Co. is having plans prepared for the construction of a 3 story and basement garage. Estimated cost $75,000. F. D. McEnteer, Clarksburg, Archt.

W. Va., Raleigh—Raleigh Transportation Equipment Construction Co., Beckley, will build 1 story, 60 x 130 ft. garage, here. Estimated cost $40,000. Private plans.

Wis., Delavan—H. C. Hengels, Archt., 445 Milwaukee St., Milwaukee, is receiving bids for the construction of a 2 story, 34 x 60 and 20 x 62 ft. garage and filling station for A. H. Schumacher, here. Estimated cost $50,000.

Wis., De Pere — F. Bloom is receiving bids for the construction of a 1 story, 40 x 60 ft., garage and repair shop, on 3rd and Oneida Sts. Estimated cost $40,000. Private plans.

Wis., Kenosha—Mantkus Motor Sales Co., 313 Park St., awarded the contract for the construction of a 1 story and basement, 64 x 124 ft. garage. Estimated cost $40,000.

Wis., Kiel—Kiel Machine Co. soon lets contract for the construction of a 1 story, 62 x 84 ft., machine shop. Estimated cost $40,000. W. F. Neumann, 114 Grand Ave., Milwaukee, Archt.

Wis., Madison—P. Dean, Archt., Dean Bldg., is receiving bids for the construction of a 2 story, 66 x 224 ft. garage and repair shop for Gill Bros., c/o A. Gill, 452 West Wilson St. Estimated cost $80,000.

Wis., Madison—F. L. Kronenberg, Archt. Carroll Blk., is receiving bids for the construction of a 2 story, 60 x 150 ft. garage, show room and repair shop, on Washington St., for Capitol Garage Co., South Pinckney St. Estimated cost $80,000.

Wis., Madison—The Madison Nash Co., 155 East Wilson St., plans to build a 2 story, 66 x 122 ft. garage and repair shop. Estimated cost $40,000. Engineer or architect not selected.

Wis., Madison—J. Petersen, 102 South Orchard St., awarded the contract for the construction of a 2 story, 99 x 127 ft. garage and repair shop. Estimated cost $40,000. Noted May 3.

Wis., Madison—The Wiedenbeck-Doblein Co., 601 West Mifflin St., awarded the contract for the construction of a 99 x 127 ft. garage on Bedford St. Estimated cost $40,000.

Wis., Milwaukee—A. L. Richards, 90 Mason St., awarded the contract for the construction of a 1 story, 122 x 242 ft. garage on Knapp St. Estimated cost $160,000.

Wis., Park Falls—Flambeau Paper Co. is receiving bids for the construction of a 1 and 2 story, 100 x 150 ft., machine shop, carpenter shop, etc. Estimated cost $160,000. Brust & Philipp, 405 Bway. Bldg., Milwaukee, Archts.

Wis., South Milwaukee—The Bucyrus Co. has awarded the contract for the construction of 1 story, 100 x 106 ft., 60 x 65 ft., 40 x 41 ft. and 20 x 30 ft. additions to its steel foundry, 42 x 47 ft. shop and 20 x 41 ft. lavatory. Noted Apr. 19.

This is NOT the end—

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SEARCHLIGHT SECTION

of this issue

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Turn Now To pages 109 to 121.